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# BETTER FRUIT

VOLUME XIV

JUNE, 1920

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U.S. DEPARTMENT OF AGRICULTURE

NUMBER 12

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The Flat-Headed Apple Tree Borer  
Birds—Their Benefit to Horticulture  
Bees as Pollenizers and Spray Injury  
Means of Accomplishing Orchard Tillage

Comp  
Brodie D A  
Dept of Agriculture



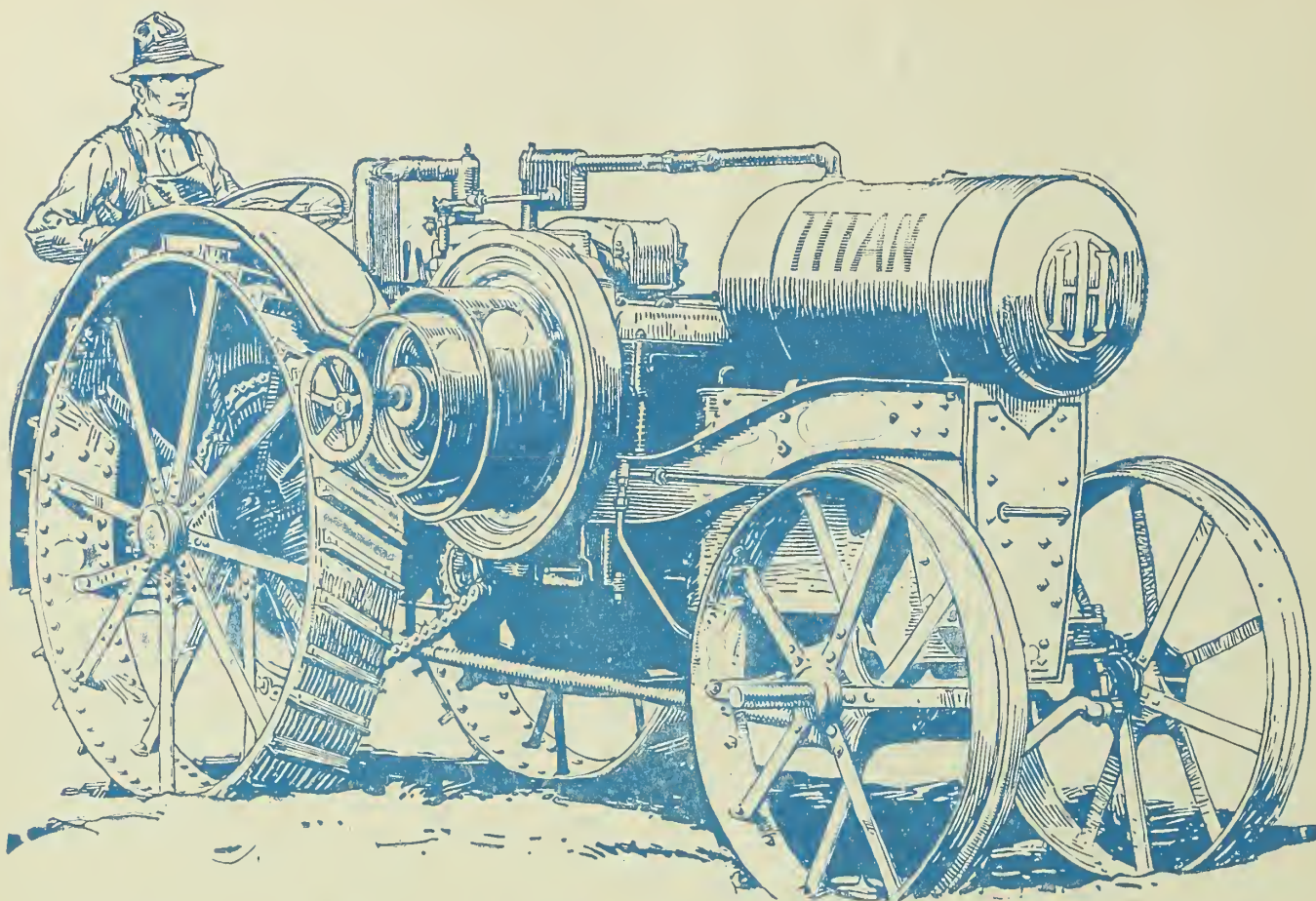
FIELD OF CLOVER IN ONE OF THE DIVERSIFIED ORCHARD DISTRICTS OF THE NORTHWEST  
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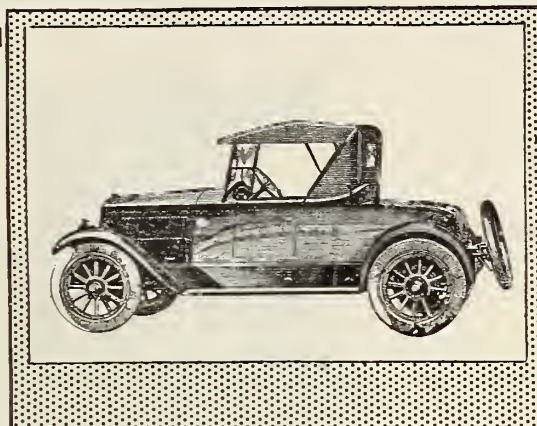
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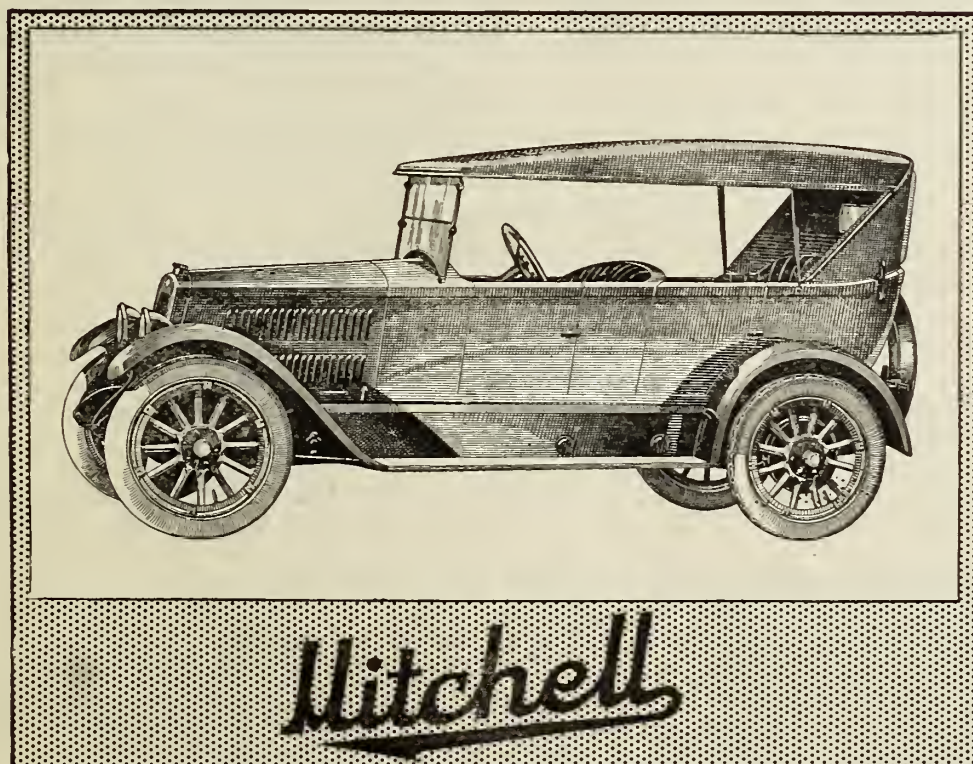
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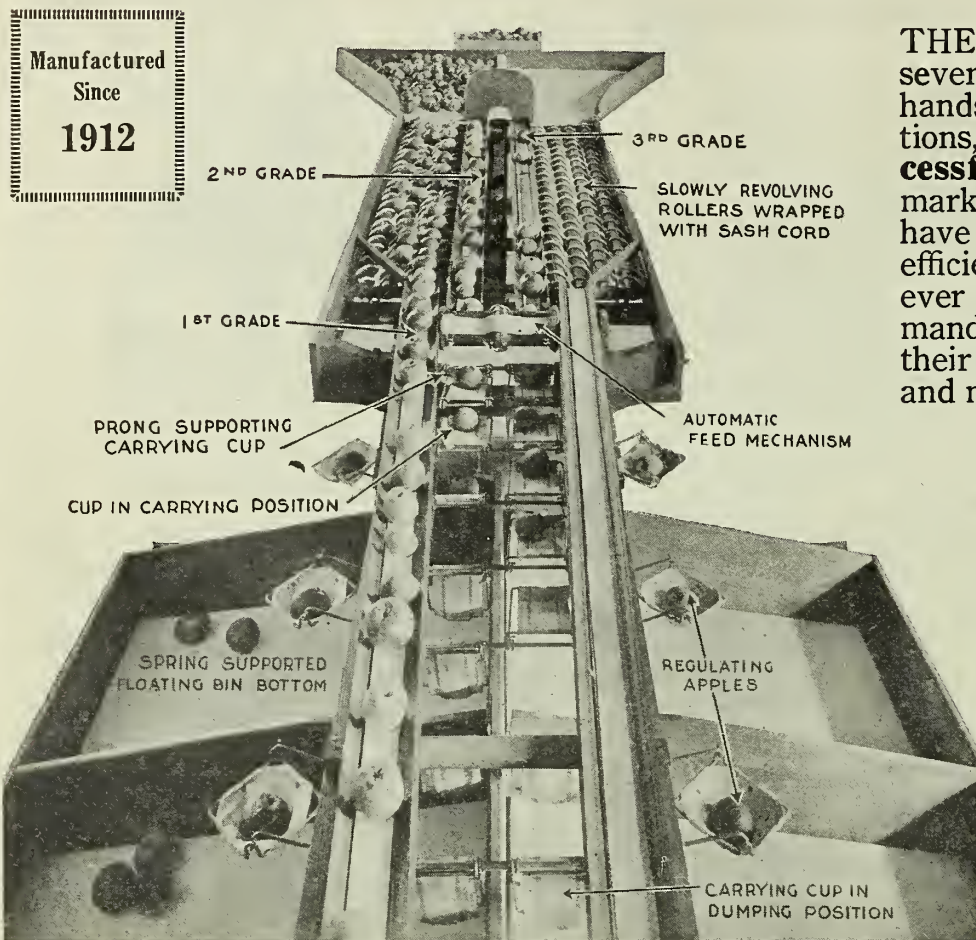
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# BETTER FRUIT

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NUMBER 12

## The Flat-Head Apple Tree Borer—Methods of Control

By Fred E. Brooks, Entomologist, Deciduous Fruit Insect Investigations U. S. Department of Agriculture

OF the several kinds of wood and bark boring insects which attack fruit trees in the United States, the flat-headed apple-tree borer is one of the most widely known. The adult form is a medium-sized beetle, native to American forests, which has attacked cultivated fruit trees since the pioneer days of orcharding in this country. It is now known to occur in nearly every state of the union and also in southern Canada. Throughout this region it injures every year a great variety of fruit trees, as well as many kinds of shade and forest trees.

Trees of almost any size after they are one or two years old may be attacked, but, as a rule, injury is confined to those that have already been weakened by some other agency, or that are abnormal either in their position or in general health. Trees that are newly transplanted, that have assumed a leaning position, that are deficient in vigor from starving or over-bearing, that have been subjected to the injury of the trunk or branches by sun-scald or other diseases or weather conditions, or that have suffered injury from tools, rodents, or insects, invite attack by this insect. On the other hand, trees that are normally vigorous, upright in growth, and have sound, healthy bark, very rarely, if ever, are injured by the flat-headed borer.

### Location and Nature of Injury

Injury to trees is done by this insect only while it is in the larva or grub stage, and the species receives its common name from the fact that the grub is flat-headed. The grubs or borers enter the bark of the trunk of the larger branches and feed between the bark and sapwood until about full grown. They then usually burrow a short distance into the wood, where they pass the winter and, in the spring following, change to the pupa, or resting stage and a little later into beetles. The burrows in the bark and sapwood are broad and irregular in shape, the form depending very much upon the size of the tree and thickness of the bark. In old trees most of the feeding is done in the thick inner bark, and the wound made is often more or less circular in outline. In young trees the feeding is

mostly from the sapwood, and the wound is likely to be more elongate, often encircling the tree and killing it.

The borer while feeding keeps a clear space around itself to allow of free movement, but packs the excavation behind with a compact mass of digested wood particles. In large trees injury almost invariably is confined to the sunny side. In such a place a wound that was small in the beginning may be enlarged year after year by succeeding generations of the borers working around the borders of the wound at the point where the live and dead tissues of the tree meet.

Scarcely any castings are thrown out, and the place where borers are at work is not always clearly marked on the surface of the bark. Injured spots, however, usually can be detected from the outside by the darker color and slight depression of the bark and often by cracks which form in the bark, through which the frass (excrement) shows. Usually, where an area on the trunk of a tree is killed by borers, a strip of dying wood soon extends some distance above it, and this strip is in turn attacked and enlarged by the borers.

### Food Plants

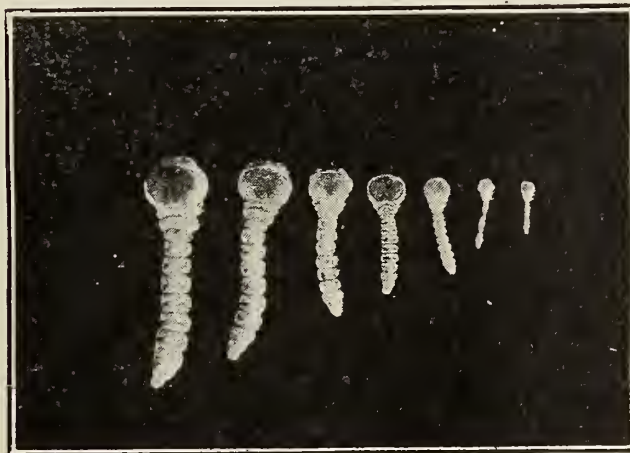
Following trees and shrubs are known to be attacked by the flat-headed apple tree borer: Apple, pear, peach, apricot, plum, prune, cherry, quince, currant, walnut, pecan, hickory, Carolina poplar, willow, weeping willow, beech,

chestnut, oak, elm, hackberry, sycamore, mountain ash, service berry, hawthorn, redbud, sugar maple, soft maple, horse-chestnut, linden, Japanese persimmon, and box elder. Where orchards are planted adjacent to woodlands, the beetles often come from the forest trees and deposit eggs in the fruit trees before they have recovered from the shock of transplanting. The borers hatching from the eggs deposited on the newly-set trees find the devitalized bark and wood exactly to their liking, and often girdle and kill many of the trees. After the trees have had one season's growth, they are usually safe from attack so long as they are kept in a vigorous condition.

### Appearance and Habits of the Insect The Adult

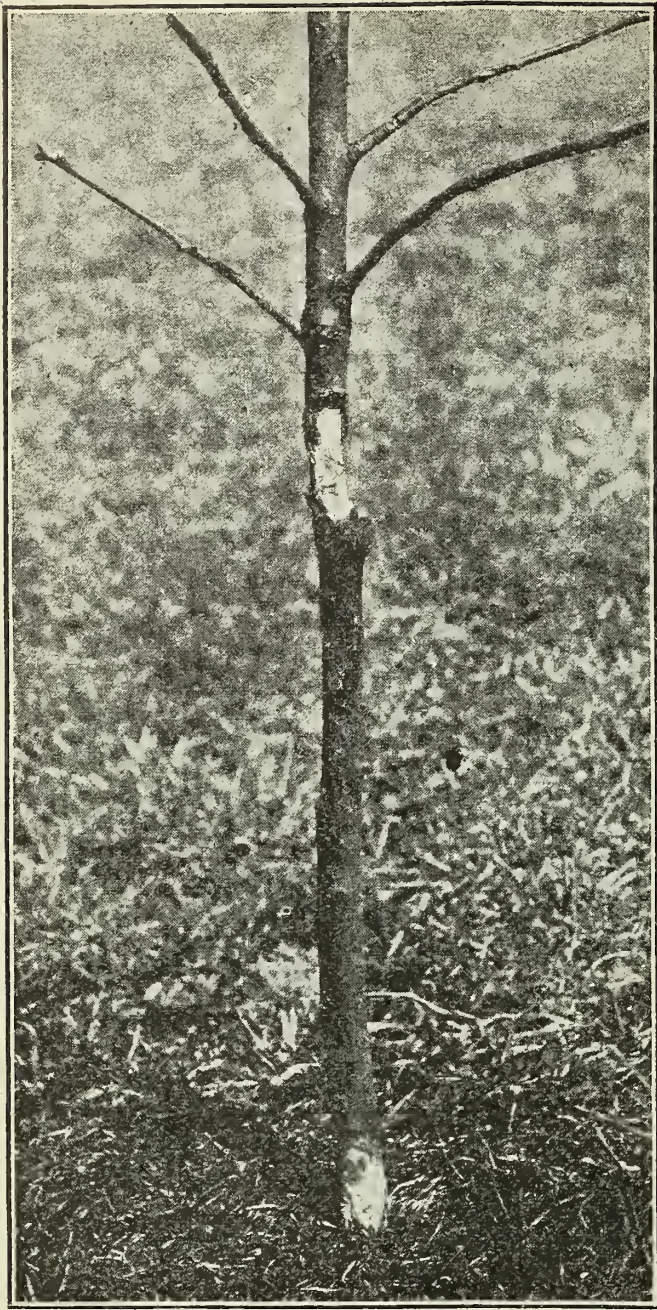
The adult of the flat-headed apple-tree borer is a broad, flat beetle, averaging about half an inch in length by less than one-fourth of an inch in width, though individuals differ considerably in size. It tapers from the center towards both ends. The color of the back is dark brown, indistinctly marked with spots and irregular bands of dull gray, the whole, when viewed under certain conditions of light, having a slight brassy sheen. The underparts of the body are bronze, and the back beneath the wings is brilliant metallic greenish blue. In flight the beetles produce a musical buzzing sound not unlike the humming of a bee.

The beetles issue from the wood soon after the blooming period of the apple, and remain upon the wing for several weeks. They are active, run rapidly, and take flight quickly when disturbed. On hot, clear days they may be found on the sunny side of the trunks and larger branches of their host trees, where mating takes place and where the eggs are deposited. The female spends much time running with an intermittent gliding movement over the bark, feeling out places with her ovipositor for laying her eggs. When a suitable crack or opening in the bark is found she inserts her slender, tube-



Flat-headed apple tree borers to be found in infested trees at almost any season of the year. Natural size.





Apple tree first year after transplanting, girdled and killed by flat-headed apple tree borers.

like ovipositor into the opening and then remains quiet for a few seconds while the egg is being placed. After the egg is disposed of she moves on in search of other places for ovipositing. It very frequently occurs that one or more females, while engaged in egg laying, will visit a single opening in the bark several times, resulting in a small group of eggs being placed near together. The borers hatching from such groups of eggs feed away from the center in opposite directions, and often eat out a large connected series of burrows.

#### The Egg

The egg, which is pale yellow in color, is flattened, disk-like, and wrinkled, and is about one-twentieth of an inch in diameter. It is attached firmly to the bark by its flat surface and hatches in from 15 to 20 days. The eggs are usually concealed beneath a scale of bark or within a crack or wound in the bark. A single female probably produces on an average not far from 100 eggs.

#### The Larva

The larva is a yellowish-white, footless grub, which attains a length of about one inch. The three segments of

the body next to the head are swollen and flattened, which accounts for the names "flat-head" and "hammer-head," by which the species is commonly known. The larva is usually found curved like a horseshoe, and is sluggish and inactive except in very warm weather.

On hatching, the larvæ usually enter the bark from directly beneath the egg, and, if the wood is in favorable condition, burrow at once into the inner bark, where they feed on the bark and sapwood and develop rapidly. If, on the other hand, the tree is vigorous and full of sap, the borer is unable to thrive within the growing tissue and may soon die or may live for months just beneath the hard outer layer of bark, where it obtains barely sufficient food to maintain life. Under such conditions the borer sometimes lives for a year or longer, surviving the cold of winter but making scarcely any growth. In time it dies a slow death by starvation, unless that part of the tree where it is located should become sufficiently enfeebled for the borer to penetrate to the inner bark undisturbed by the flow of sap. Where such a condition arises the previously starved borer begins at once to grow and develop, but its period of existence in the tree may be lengthened by a year as a result of unfavorable conditions in its early life.

Under favorable conditions the transformation from egg to adult covers a period of one year, but where the development of the larva is retarded by insufficient food, as described above, the period may be lengthened to two years and possibly longer.

It not infrequently occurs that the bark of trees that are but slightly on the decline, or, especially, those that have assumed a leaning position so that the sun's rays fall directly upon the trunk, will contain constantly for years these little, starved flat-headed borers that are unable to come to maturity. If such trees continue to decline, the time is sure to come when the borers can penetrate to their favorite feeding place and complete their transformation. After this the injury to the tree is likely to increase rapidly.

Late in the summer the borers that are approaching maturity burrow abruptly into the wood to a depth of from less than an inch to several inches, and at the end of their slender gallery in the wood construct a flattened pupal chamber in which they pass the winter. After the borer settles in the pupal chamber its color changes to a deeper shade of yellow. In the southern part of its range pupation often takes place within a cell constructed between the bark and wood, adjacent to the feeding galleries.

#### The Pupa

The pupa averages one-half inch in length and one-fourth inch in width, and resembles in shape and dimensions a small pumpkin seed. When first formed it is yellowish-white, but later its rudimentary eyes, legs, thorax and other parts of the body take on a metallic brown color. In from three to five weeks it transforms to the adult stage and the beetles escape from the wood by means of the entrance galleries of the larvæ.

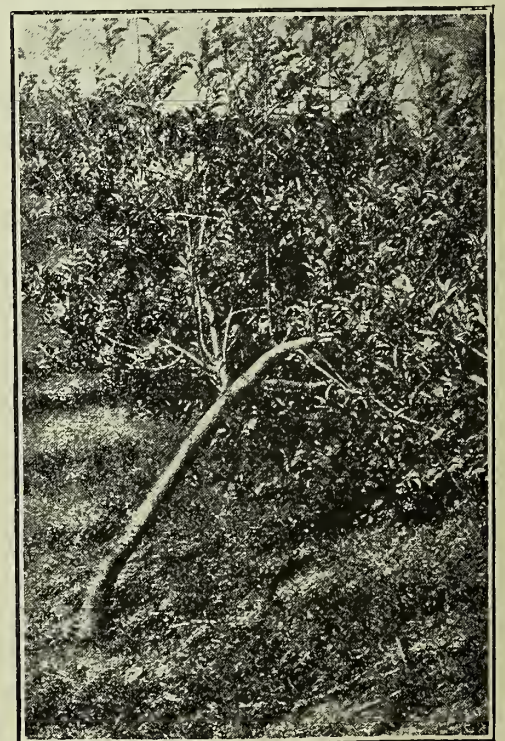
#### Natural Enemies

The flat-headed apple-tree borer falls a prey to a number of natural enemies which destroy it during its larval, pupal, and adult stages. Woodpeckers devour many of the insects by penetrating to their feeding places in the wood, and the United States Biological Survey has found the beetles in the stomachs of the common crow, kingbird, and red-eyed vireo. Among insects, ants seek out and devour both larvæ and pupæ while they are in the wood, and six hymenopterous parasites are known to attack the species.

#### Methods of Control

In the control of the flat-headed borer nothing is more important than such cultural methods as will keep the trees in a normally vigorous and growing condition. Such trees are rarely, if ever, injured. All the well-known orchard practices, such as cultivation, fertilization, spraying, and pruning, have an important effect in lessening the possibilities of injury from flat-headed borers. Such practices tend to keep the trees thrifty and resistant to borer attack.

Trees should be maintained in an upright position, and, where practicable, should be headed low in order to reduce the chances of sun-scald and winter crackling and killing of the bark, both of which invite borer attack. Low-



Leaning apple tree with trunk exposed to direct rays of the sun. Flat-headed borers may always be looked for in such trees.



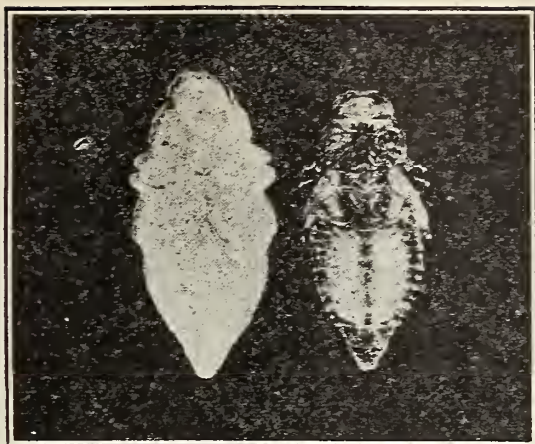
headed trees also have their trunks shaded during the summer, and the sun-loving beetles will not alight upon them to deposit eggs.

Eggs may be deposited upon perfectly healthy bark, but the young borers which hatch from eggs so placed are not able to develop, probably for the reason that their burrows, as soon as they extend to the growing tissue, become filled with sap and the borer has to recede or be drowned.



Adult flat-headed apple tree borer. Enlarged.

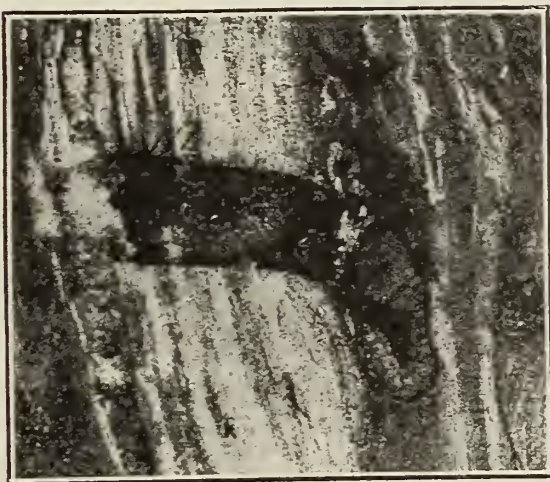
Newly transplanted trees sustain the greatest loss from this insect because it is impossible to avoid a period of retarded growth following the removal of the trees. After being transplanted, trees should be watched carefully throughout the summer and the borers removed with a knife before they have had time to make deep wounds in the bark and wood. The knife should be used with great care to avoid unnecessary cutting of the bark at a time when the tree is already weakened. An excellent practice where trees are planted near woodlands, or in any position where flat-headed borers are likely to be numerous, is to shade the trunk of the tree by means of a board driven



Pupae of flat-headed apple tree borer. Enlarged.

into the ground on the south side of and close to the tree. The shadow on the trunk repels the female beetles while they are looking for places in which to deposit eggs. Boards six inches wide and slightly longer than the trunks of the trees are suitable for this purpose.

The beetles during the period of egg-laying make short and frequent flights to examine all sorts of trees and logs. Through this habit they may be trapped by setting poles post-fashion in the orchard and covering them with some lasting sticky material that will en-



Flat-headed apple tree borer in pupal cell in heart of young apple tree.

tangle and hold the beetles when they alight. Newly cut logs of almost any size can be made to answer the same purpose by placing them in the orchard and treating the surface with some sticky substance. Oak, hickory, chestnut, willow, or almost any kind of poles or logs may be used, as the beetles do not appear to discriminate before alighting.

When trunks of trees are injured accidentally by cultivators or other tools the torn fragments of the bark should be pared away and the whole injured surface treated with a heavy coat of white lead paint or some good tree paint. This will prevent borers from entering around the borders and extending the wounded area.

Occasionally the bark of a tree is badly bruised by hail, the injury being followed by flat-headed borer attacks. In such cases, where possible, the trees should be stimulated by cultivation and fertilization to make a quick, strong growth in order to prevent or overcome borer injury. The bruised surface

of the trunk and larger branches should also be covered with a coat of paint.

In any case where paint is applied, it is well to see that the coat is in good condition immediately following the blooming period of apple, for it is at about this time that the beetles appear and begin egg laying. Kerosene emulsion, nicotine sulphate solutions, soapy and alkaline washes, and other penetrating caustic and poisonous materials have been applied as sprays and in other ways to infested trees in the hope that enough of the materials would soak through the bark to kill the borers. Such treatments, however, have usually proved disappointing, although in some cases, when applied early in the season, a considerable portion of the very small borers have been destroyed. Burlap or paper wrapped around the trunks of trees will prevent the beetles from ovipositing on the bark. When this method is used, the wrappers should extend from the ground to the branches, and should be tied at the top and mounded with earth at the bottom. The wrappers should be removed at the end of the egg-laying season.

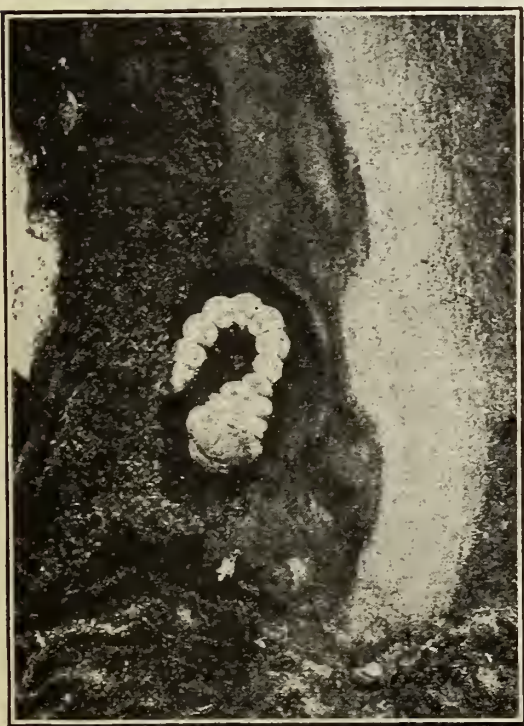
Dying trees and newly cut logs and prunings should never be left standing or lying about the orchard from one season to another. This applies to trap poles and logs used to catch the beetles and to dying wood of fruit and forest trees of almost any kind. Such wood may contain numbers of flat-headed borers that would change to beetles in the spring and deposit eggs within the orchard trees, providing thereby for a new generation of borers. All such wood should be burned during the autumn or winter or in the early spring before the blooming time of apple trees.

#### UNQUESTIONABLY—

Modern methods applied to fruit growing have made the Northwest a great fruit growing center, with possibilities of extensive development.

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OF THE ROCKY MOUNTAINS



Flat-headed apple tree borer feeding between the bark and wood of apple tree.



# Birds—Their Practical Benefit to Horticulture

By George A. Blair

**B**IRDS have a definite place to fill in the economy of nature. They are the principal check on insect life. For years the experts of the United States Biological Survey have been making tests to determine which birds are more useful to man. These investigations have shown that with rare exceptions birds are useful everywhere and that without their help successful agriculture would be impossible.

About thirteen thousand species of birds are known to science; twelve hundred of these species inhabit the United States. We find the sparrows, thrushes, wrens and many others, which feed on insects in or near the ground. Others, such as woodpeckers and sapsuckers are arboreal in their habits, preying on the many kinds of insects which infest our orchards and forest trees.

The bark of trees forms a favorite shelter for numerous insects. The wrens, nuthatches, warblers and creepers, with the sharpest of eyes and slenderest of bills detect our foes and dislodge them from crevice and cranny. The air is full of flying insects in spring and summer. It is the swallows, the purple martins and the swifts which take care of these. At nighttime the whippoorwills, night-hawks and chuckwills-widow keep up the good work while the swallows and martins sleep.

Thus, every family of birds plays its own part in the warfare against insects, and by so doing contributes to man's welfare. When the quail eats Texas fever carrying ticks (which southern quails do); when the killdeer and other shore birds eat hundreds of larva of the malaria and yellow fever carrying mosquitoes; when a nighthawk's evening lunch consists of five hundred of the adult mosquitoes; they contribute a great benefit to public health.

The economic value of birds to man lies in the service they render in preventing the undue increase of insects, in devouring small rodents, in destroying the seeds of harmful plants, and in acting as scavengers.

Mr. E. H. Forbush, ornithologist of the board of agriculture of Massachusetts, states that the crops of four chickadees contained 1,028 eggs of the cankerworm. The stomach of four other birds of the same species contained about 600 eggs and 105 female moths of the cankerworm. The average number of eggs found in 20 of these moths was 185, and it is estimated that a chickadee may eat 30 female cankerworm moths per day during the 25 days which these moths crawl up trees, it follows that in this period each chickadee would destroy 138,750 eggs of this noxious insect.

The benefit derived by having the seed of noxious weeds destroyed by our feathered friends cannot be overestimated. From late fall to early spring seeds form the only food of certain birds, and every keeper of cage-birds

can realize how many seeds a bird may eat in a day. Thus, while the chickadees, nuthatches, woodpeckers and some other winter birds are ridding the trees of myriads of insects' eggs and larvæ, the granivorous birds are reaping a crop of seeds which, if left to germinate, would cause a heavy loss to our agricultural interests.

The service rendered to man by birds in killing the small rodents so destructive to crops is performed by hawks and owls—birds which the uninformed consider enemies. The truth is that, with two exceptions—the sharpshinned and cooper's hawk—all our common hawks and owls are beneficial.

Here are a few records as to the value of certain bug eaters: A quail killed in a cotton field in Texas had in its crop the remains of 127 cotton boll weevils. Another killed in a potato field in Pennsylvania had in its crop the remains of 101 potato bugs. Another killed in a Kansas wheat field had in its crop the remains of over 1,200 chinchbugs.

Mrs. Margaret M. Nice, of Cambridge, Massachusetts, has made an exhaustive study of the food of Bob White. Instead of killing the birds and analyzing the contents of the crop, she has worked by the living feed-test method. That is, she has offered different foods to the birds and has counted and weighed the amount eaten. The total food for a day forms a natural unit in this work, and a great many of these daily dietaries have been studied, among them we may quote a few: 1,350 house flies eaten in one day by a laying hen, along with weed seeds and green food; also another time 5,000 aphids and 1,285 rose slugs; 37 grasshoppers and 2,400 seeds of pigeon grass by a six-weeks old chick; also 65 large black crickets, half of these must have been females and packed with eggs; 84 grasshoppers by a seven-weeks-old chick; 700 insects, 300 of them grasshoppers, by a laying hen in July; 48 grasshoppers by an adult hen in October.

Tests were made to determine how many weed seeds a quail would eat in a day. Some of the results are:

Curled dock .....	4,175
Pigweed .....	12,000
Plantain .....	12,500
Smartweed .....	2,250
Lambs quarter .....	15,000

The Bob White has been known to eat 135 different kinds of insects, many of them the most injurious we have: The potato beetle—which few other birds eat—cucumber beetle, cutworm, army worm, wire worm, chinch bug, cotton boll worm, and cotton boll weevil.

These studies, which constitute the most complete and careful investigations ever made of the food of any bird, have enabled Mrs. Nice to estimate that a Bob White hen will eat an average of 75,000 insects and 6,000,000 weed seeds in a year—about 7½ pounds insects and

100 pounds of weed seed. The natural life of a quail is about ten years, so that each of these birds may be supposed to eat during its lifetime 7,500,000 insects and 60,000,000 weed seeds. Yet there are thousands of men who delight to go out in the fall and kill every quail they can find! A dead quail is worth in the market possibly \$1. A man may eat it in a few minutes and forget it. What a shameful ending for such a useful and so valuable a friend of mankind. A few years ago there were millions of quail all over the southern, middle and eastern states; today they are almost extinct everywhere.

A pair of Bob Whites in domestication have produced 100 eggs in a season. Five hens laid an average of 65 eggs apiece. To hold the insects in check and to destroy the weed seeds we need to have our gardens, fields, pastures and roadsides literally alive with these useful birds. A prairie chicken killed in a cotton field in Texas had in its crop the remains of over 300 cotton boll weevils. A few years ago there were millions of prairie chickens in all the states. Today they are absolutely extinct in several states and on the verge of their finish in all others.

An ornithologist who has carefully studied the ruffed grouse (commonly called pheasant or partridge) has estimated that each adult bird of this species eats two and one-half bushels of insects every summer. There are nearly 200 species of insects that injure apple trees or apples, and nearly as large a number that attack pear trees, peach trees, plum trees and cherry trees. There are 107 species of bugs that prey on elm trees, 264 that attack poplar, 396 that prey on the birches, 154 that work on beech trees, and over 400 that attack oak trees.

Fitch once computed the number of plant lice on a single cherry tree to be 12,000,000. Chinch bugs have been found in a small clump of bunch grass eight inches in diameter to the number of 20,000. J. F. Parker of Manhattan, Kansas, says he counted 6,000 under similar conditions, but had to desist on account of more pressing duties. Wiley once computed that the hop aphid, developing thirteen generations in a single year, would, if unchecked to the end of the twelfth generation, have multiplied to the number of ten sextillions. C. L. Marlatt calculated that the Hessian fly damage to the wheat crop in 1900 was \$100,000,000. The chinch bug as early as 1864 damaged staple crops \$100,000,000, and Wiley placed the damage at \$73,000,000.

Beal says many crops of the Franklin gull showed 48 to 90 grasshoppers each. House martins, swallows and swifts eat rose beetles, May beetles, cucumber beetles and house flies, practically all which are caught on the wing. Otto Widman says 32 parent martins made 3,277 visits to their young with insects in one day. C. C. Musselman

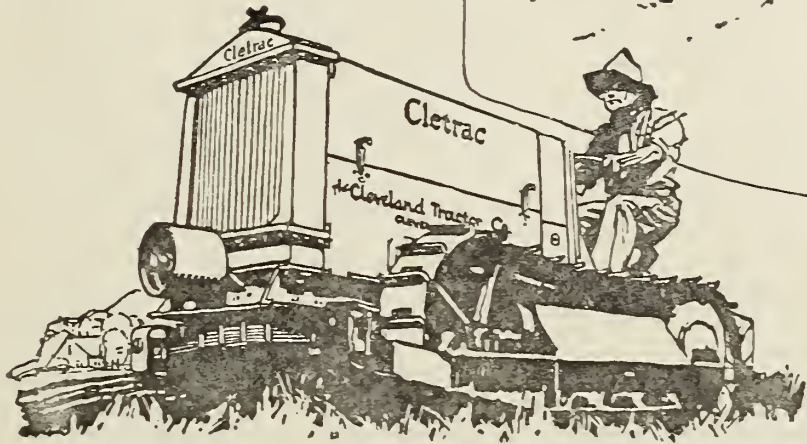
Continued on page 23.





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## Honey Bees as Pollenizers and Spray Injury

By Susan M. Howard, in Massachusetts Report State Board of Agriculture

TREATING the subject as a fruit grower as well as a beekeeper enables the writer to appreciate the inestimable value of the honey bee as a pollenizer of certain grains, small fruits, vegetables and tree fruits. The discussion is attempted in plain terms without resorting to confusing botanical technicalities. The writer will feel amply repaid if the article is stimulative of even a minor inquiry into the ways of bee nature.

Today the honey bee is more and more considered an invaluable ally of the farmer. The orchardist and small fruit grower consider their colonies as a part of their equipment, and their use as much a factor in the success of horticulture as is cultivation, application of fertilizers, the growing of cover crops, pruning, spraying and the like. To the farmer, especially if he be a fruit grower, a honey crop may be regarded as secondary, or as a by-product, while to the beekeeper it is the primary product. Thus while the ultimate aims of the horticulturist and beekeeper may be different, yet they are interdependent.

While the orchardist may profit by the visits of bees from nearby apiaries, or from a wild colony in a tree, roof or chimney, yet the uncertainty of their service is so great that the forehanded fruit grower provides a sufficient number of colonies at hand and among his trees. In this connection it may be said that it is not absolutely necessary to place the colonies actually in the orchard, yet they should be not far distant. Furthermore, the location of the bees should not prevent satisfactory cultivation.

As a factor of the importance of bees near by an orchard, it may be cited that the distance at which bees gather pollen is limited, seldom exceeding one-half mile, which emphasizes the desirability of bees at close range. On the other hand, bees will forage for honey at a greater distance, up to about three miles from the hive. Nevertheless, they prefer frequent and short trips. Thus if a radius of three miles be allowed,—that is, a diameter of six miles—the area of the circle would be 28 square miles, or 18,080 acres, a part of which territory would be imperfectly worked. It should be remembered that bees foraging for honey frequently serve as the bearers of pollen in cross-pollination, as well as bees foraging for pollen alone. It is this search of the bees for their food which prompts their inestimable service to the fruit grower. The means and mechanism of their operation, though mechanical yet intricate, is referred to below. Being mechanical, it might be accomplished by man at great expense and with exceeding labor, but this is generally recognized as impracticable from the commercial standpoint. Bee labor is far cheaper than human labor.

This expensive process of hand pollination is exceptional and only one case is reported. In this instance the process was resorted to by a cucumber grower to whom the sting of the honeybee was seriously poisonous. The process, however, is exceedingly old, and according to Herodotus is known to have been practiced five centuries before the Christian era. Much the same method is today reported as that used by this cucumber grower who has re-

sorted to hand pollination, and who employs the tip end of a stiff feather by which he transfers the pollen of one flower to the sensitive pistil of another. In contrast to this laborious method, the far more common practice of the growers of cucumbers under glass is to utilize a colony or more of honeybees in their greenhouses. Thousands of colonies of bees are thus used in the hothouses around Boston and in Massachusetts. Unfortunately, too, many or most of these are sacrificed, as the growers make little or no effort to save the colonies which have served them so faithfully in the tropical climate of the greenhouse—conditions adverse to their well-being.

### The Function of the Honeybee in the Transfer of Pollen.

It is far from the purpose of this paper to enter the vast and intricate field of hybridization, involving the problems of plant selection, improvement and the production of new varieties. Neither can the details of the life history of the honeybee be given in detail, which is as unlimited and wonderful a field as are the intricacies of the plant world, yet it is desirable to make clear the relation and service of the honeybee to the setting of our common fruits and vegetables.

It should be remembered that in most plants the setting of the fruit involves a sexual process. In plants, in contrast to animals, the same individual may bear both sexes or the sexes may be apart in different individual flowers. More in detail these may be grouped under three headings:

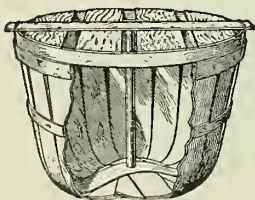
1. Both Sexes in One Flower—Some plants produce perfect or bisexual flowers, that is, those in which both the male and the female organs of the flower, the stamen (male) and the pistil (female), are complete within the flower. As an example, Parson's Beauty strawberry may be cited.

2. The Sexes Separated in Individual Flowers—Other plants bear flowers which are individually staminate (male) and pistillate (female.) Yet both sexes appear on the same plant, as, for instance, in the squash, melon and cucumber.

3. The Sexes Separated in Individual Flowers Which Are Borne on Different Plants—As a further modification of the second class, there are also plants which produce only staminate (male) blossoms throughout the entire plant, and are spoken of as male trees or plants. Others produce pistillate (female) blossoms throughout the entire plant, and are spoken of as female plants. Examples of these are found in the willows and poplar. The Sample strawberry is pistillate (female.)

It at once becomes apparent in recognizing that most of our fruits and vegetables involve a sexual process or the union of the pollen and germ of the egg, that there must be some means of union, especially in the second and third classes of flowers, where the two sexes are respectively separated either in individual flowers or in individual flowers on separate plants. From practical experience, moreover, it is gener-

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ally conceded that the honeybee is the most important of the many agents in this service. Other insects render their service as well, but their service cannot be depended upon. Their numbers are uncertain and fluctuating. They may be absent at the very time when they are most needed, as, for instance, at the height of apple bloom. Thus it is claimed that the honeybee is first and foremost the most important, and that it should be provided and conserved by the farmer.

Since there are differences in pollen, however, it might be contended by some that the wind is active in transferring the pollen from tree to tree or blossom to blossom. To be sure, some pollen is lighter than others and easier carried by the wind, but in the provisions of nature, pollen which is light and transferable on the breezes is designed so to be carried, and trees which bear it are usually wind pollinated, those which are actually independent of insects. The pines furnish an example. Observations are not infrequent where the air has been seen filled with millions of pollen granules drifting with the wind. But among the fruits and vegetables the pollen is usually more heavy and inclined to be sticky or viscous, as is the case with the pear. This heavy pollen, in order to be transported, is dependent upon the service of some insect, usually the honeybee, and is capable of being carried by the wind to a very slight, if any, extent. In the case of apples, too, experiments have been conducted which tend to prove that little or no pollen in the apple orchard drifts on the wind.

The service of the honey bee, alluded to in transferring pollen, may be regarded as performed unconsciously or unintentionally while seeking for nectar or pollen in the flowers. In procuring the nectar, for instance, which flowers dependent upon the services of insects usually produce in abundance, there is a secretion in the nectary or honey-cup at the base of the flower. The bee, for illustration, dusts off particles of pollen which become entangled in her hair. Then the bee in quest of more nectar flies to another blossom and in the course of her search for nectar therein leaves some of the pollen on the female organ of the blossom (pistil.) Thus, almost mechanically and accidentally, the function of the bee has been performed in this vital operation. Finally, the pollen lodged on the sensitive pistil germinates much as does seed, and sends forth or projects a slender growth or thread which gradually finds its way down through the pistil and reaches the true female element or ovule which is virtually the embryonic seed. Here, there is a fusion of the male and female elements which, when it occurs, perfects the process known as fertilization, wherefrom results a perfect seed.

Many plants are sterile to their own pollen and require pollen from another source. Furthermore, self-fertilization is thought to tend to weaken the offspring, and in contrast crossing or cross fertilization is thought to result in greater strength and productivity. Moreover, flowers are generally con-

structed to favor cross fertilization and to prevent perpetual self-pollination.

From the standpoint of the plant, the results of crossing become apparent especially in the second generation. Thus the Baldwin apple blossom may be fertilized by pollen from a Porter apple. The resulting apple will develop as a Baldwin, yet one or more of its seed when planted may produce a variety, differing in many respects from its parent. Thus the bees may serve to make new crosses and to increase varieties.

There is also another feature, namely, the apple requires five independent fertilizations for complete results. The lack of even one of these may impair its vigor and change its appearance, resulting in an imperfect development or malformed fruit. Incomplete fertilization also explains the dropping of apples, and suggests that the more complete service of bees might avoid this consequent loss.

Some light may be thrown on the dependence of flowers on bees by a few concrete examples. An experiment was conducted in which 100 clover blossoms were covered with netting in order to exclude bees, with the result that not a single seed was produced. Similarly 100 blossoms exposed to the visits of bees produced, in contrast, 2,720 seeds, showing conclusively the need of bees in seed setting in clover.

With the apple, 2,586 blossoms were covered and the entrance of bees prevented, with the result that only three apples matured.

It is not uncommon to observe from four to six bees eagerly at work gathering honey and pollen in a single squash blossom. The writer has noted eight bees simultaneously in a squash blossom; within an hour twenty-eight bees were counted flying from the same blossom.

The number of flowers a bee will visit may vary according to the amount of nectar being produced. A bee can visit ten to fifteen flowers a minute, yet she will remain longer on a flower if the nectar is flowing freely. In that case, she would secure her load without visiting as many flowers.

In attracting bees to a flower, there are several stimulative factors, namely, the nectar and pollen, color and odor. The multiplicity of trees in full bloom increases the attraction. Nevertheless, high color or extreme fragrance do not always induce the bees to visit, for the lilac and heliotrope are neglected, while some of the less conspicuous flowers prove enticing.

Besides the nectar in the flower, bees are in search of pollen as a food. This is a highly nutritious substance, supplying nitrogen and phosphorus—two needed elements in animal economy. To be sure, this pollen is provided vastly to the excess of the actual needs of bees, but its seeming over-production may be explained on the ground of an effort on the part of the plant to insure pollination.

It has been claimed that the honeybee sucks juices from fruits. Although bees are observed commonly on fruits, yet

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it is certain that the bee does not puncture a sound fruit as has been supposed. When fruits are worked by bees, an opening has previously been made by some bird or wasp or by decay. Thus the bees take up the work begun by another or afforded them through some other agency. Many orchardists have mentioned this to the writer who at the same time give due credit to the bee for the good she accomplished. It has also been the writer's privilege to dispel this idea through experimentation and by reference to high authorities who refute the charge against the bee. It should be borne in mind that the jaws of the bee are smooth and rounding and quite unfit to make an opening in a sound fruit. On the other hand, the jaws of the wasp are perfectly equipped for puncturing and opening fruit. In order to substantiate that bees are unable to puncture sound fruit, the writer has suspended a sound but over-ripe peach and pear in front of the entrance to a colony. These nevertheless remained untouched, even during a scarcity of nectar in the fields.

### The Interrelation of Spraying and Beekeeping.

While the value of the honeybee as an agent in the distribution of pollen has been emphasized, it would be remiss to fail to mention correct spraying practices. To spray any plant while in flower, more especially fruit trees while in bloom, offers baneful results: It is the old story of killing the goose which lays the golden egg. Many colonies are either damaged or lost at the time of spraying, through poison deposited in the nectar cups of the flowers. If the loss is not apparent at the time, a colony may be so crippled as to preclude its successful wintering. It is now conceded by high authorities that spraying in fruit bloom is injurious not alone to the bee but to the flower. Any solution strong enough to kill the codling moth larvae may be harmful to the delicate reproductive organs of the flower. In erroneously spraying during fruit bloom the supposed aim has been to kill the codling moth. The eggs are usually laid on the foliage of the young shoots. The larvae hatch and travel ultimately to the young fruit. There they either burrow through the side of the fruit or usually through the calyx end into the core. Since these larvae of the codling moth are not hatched and present in the blossoms, it is a faulty method to try to kill them by sprays during the blooming period, especially since the spray may injure the setting of the fruit. Moreover, this poison may effectually be distributed over the foliage and into the calyx cups at any time within ten days after two-thirds of the petals have dropped. It should be borne in mind that it is the eating of the poison and not the contact with it which kills the codling moth.

Some states have enacted laws prohibiting spraying during fruit bloom, and have imposed penalties for their violation. To the intelligent fruit grower no such prohibition should be needed, as reason and judgment would dictate otherwise. Beekeepers and fruit growers all should strive in every way possible to spread this information concerning the time and kind of spray, and the reasons and seasons for spraying.

While it may be quite impossible to regulate and restrain individuals, yet it may be suggested that contract sprayers should be licensed in order to control or make certain that their methods conform to existing laws and customs. To the beekeepers it is a pitiable sight to see struggling, half-paralyzed worker bees staggering about the hive entrance and crawling up the grass blades unable to enter the hive. This is a violent shock to the colony.

Horticulturists, fruit growers and beekeepers must unite for mutual benefits to prevent the uncalled-for sacrifice of the honeybee. Similarly, every means that ingenuity can devise to improve the breed and management of bees should be adopted. Every possible provision should be made for housing, feeding and manipulating, especially before and after the fruit and garden bloom.

**More bees and better bees, more trees and better trees!** This will insure increased production of both fruits and honey.

The planting of linden or basswood trees, beloved by bees, is especially to be recommended for shade along the street and the highway, or as an ornamental tree in parks and on estates for forest plantations. It is of quick growth, symmetrical, with smooth bark. The wood is highly valued for lumber. It produces honey of exceptional quality and in abundance, which comes at a time of scarcity of nectar in most sections. The recommendation of the planting of this tree is inspired by a desire to increase its prevalence, thereby promoting beekeeping. Any advantage which it offers to the bee rebounds to the mutual good of the horticulturist, fruit grower and beekeeper. To one who has heard the incessant hum and medley of song of the honeybee flitting among the blossoms of the linden tree on a July day no description by pen or spoken word is adequate.

As a final word, the testimony of farmers in the vicinity of the writer's apiary is convincing even to the most skeptical as to the value of bees. This testimony has always been favorable and given without solicitation. There was but one answer to a physician who inquired the reason for the abundance of fruit in the orchards and occasional fruit trees in the vicinity of the writer's apiary, while in more remote sections of the town there was a noticeable scarcity of fruit. The favored district profited by the faithful work of the writer's honeybees.

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# Successful Cherry Growing in Umpqua Valley, Oregon

By An Experienced Grower

**T**HE Umpqua Valley in Southern Oregon is pre-eminently adapted to the production of cherries. The clay loam found on the hillsides, as well as the sandy river bottom soils, are especially favorable to this fruit. But it is of the hills in this hilly region, in relation to the successful growing of cherries, that I will speak of here.

The Umpqua Valley in Douglas County is in reality made up of hundreds of different smaller valleys or intervals, divided by hills of all shapes and sizes and in their wild state generally covered with a thick growth of oak and laurel. Many of these hills are too steep for orchard purposes, but numbers of them make ideal locations for growing fruit. The soil on them is usually of a reddish brown color which, when cultivated, falls apart readily and is underlaid with clay, which holds the moisture to a remarkable extent during the dry season. In the wet season, being high and more or less steep, they have splendid drainage of both air and water; also they soon warm up in the spring and being above the river levels, the late spring frosts which generally are found to seek the low levels along the rivers and bottoms of the valleys, leave these hillsides untouched. All of these conditions are absolutely ideal for the production of the cherry.

The Umpqua Valley has been proved to be the earliest producer of fruit and berries in the state of Oregon. It warms up there sooner than any other district in the entire state. The winters are very mild and open and it is a matter of record that produce is marketed first from this county practically every season.

This being the case we are able to get our Bings and Royal Annes on the market about ten days earlier than any other district, and as this is the first tree fruit that appears, our cherries are thus in great demand for eating purposes. As far back as 1911 I sent Bing cherries to Portland and received 15 cents for them and a neighbor got 17½c for some of his, 15c for the balance. Another cherry grower received 13c for his Royal Anns at the same time and we all had requests for far more than we had to ship, at these same prices. Then as the season advances and the Willamette Valley cherries come in the price is cut so the bulk of their fruit goes to the cannery at a much lower price per pound and even then there are very good profits to be made.

As the Bing, Lambert and Royal Ann cherry all grow to such perfection and also and chiefly as they are so early and such handsome returns can be obtained for them, it is a matter of surprise that we find so very few commercial cherry orchards here. True, that there are not so very many commercial orchards of any fruit, except prunes, in heavy bearing here yet, still one would have thought that the early settlers would have appreciated sooner what could have been realized from the early

sweet cherries, and that one would find numbers of fair sized orchards. Such however, is not the case. We have now a fair acreage of commercial cherry orchards, and as few people outside of this county realize, perhaps, an enormous acreage of young apple and pear orchards.

Now as we have the soil and climate for the production of these greatest of cherries, the Bing and Lambert, and as they grow here to best advantage as I firmly believe, of any spot on earth, on which they have been tried, added to the fact that they are the earliest in the Northwest, it will not be amiss for me to say a few words on the adaptability of these varieties to our hillsides.

As all orchardists know it is not satisfactory to try to cultivate too steep a hillside. You cannot turn earth uphill with a plow, nor can you keep a disc harrow from turning over if the hill be too steep, or prevent the cultivator from slipping down hill and skinning the trees sometimes. Therefore, in order to utilize these hills of ours, which are generally the cheapest lands to buy, we must plant something which does not require much, if any cultivation.

The cherry is the only fruit that conforms to that need. Despite opinions to the contrary held by men whose words carry weight and whom I should be the last to needlessly criticize, I maintain without fear of successful contradiction, that the cherry, after its fourth year, does not need cultivation, in fact is better off without it. Practically the only disease that attacks the cherry is gumosis. As far as known at present this disease is caused by an over-production of sap, which the tree, not using, gets rid of by pushing it out to the surface, where it occurs in gummy masses, which may be small or large, and there it continues to ooze out, rotting the wood around it and finally, in a great many cases, causes the death of the tree. This being the case, anything that stimulates the growth of the tree beyond a certain extent is harmful. Now we all know that cultivating and pruning a tree stimulates the production of growth and sap and in the case of the cherry it works a positive harm.

Now as cherries ripen in June the moisture has not gone from the soil before the crop has matured and in the case of a tree over four years old the root system has gone deep enough to find moisture enough to keep it healthy the balance of the dry season.

So that is the crop to raise on our hills we firmly believe. Dig big holes at planting time, hoe well the first year or two after each rain, dig around the trees each spring till they are four years old, then they will look after themselves. Also if one plows and cultivates these hillsides, the winter rains are constantly washing away the soil and in the course of years, more good,

rich dirt is lost than most people have any idea of. Let the natural sod remain, or better still, seed it down to a good mixture of grasses as I have done in part of my orchard and raise some hay. The grass in my cherry orchard is ready to cut by May 15. This grass forms a complete protection from soil erosion in winter and helps out on the feed bills in summer. The agricultural college at Corvallis kindly told me the mixture of grasses adapted to our hillsides here and they surely were right; it is the easiest crop to get a stand of I ever seeded. It also kills out most weeds.

Our cherry growers here do not practice much of any pruning except to cut away a limb that crosses another. Do not stimulate the growth on a cherry tree. Nature will grow it as fast as it ought to be grown and you will not be troubled much with gumosis.

Another point in favor of the cherry on the hillsides is it requires the least spraying of any fruit tree grown.

Let me add a few words in closing as to the fruit itself. The Bing is the favorite shipping cherry here. It grows to an enormous size. I have measured hundreds with a tape line and found that four inches in circumference is the size of the best. When ripe they are nearly black and when a 20-pound box is faced with these magnificent specimens it would seem they must be black plums, as their great size looks too great for a cherry. As to their holding qualities, one can hardly overstep the mark; they will go to New York and back again I believe, without showing any sign of decay. There are some Lamberts raised here too, but not many, although a few have been lately planted. They are a very fine cherry, probably as good as the Bing, but perhaps do not bear quite as well. Our Royal Anns are very fine and there are numbers of Black Republicans which latter, though hardly a commercial cherry, exceed all others in quantity to the tree.

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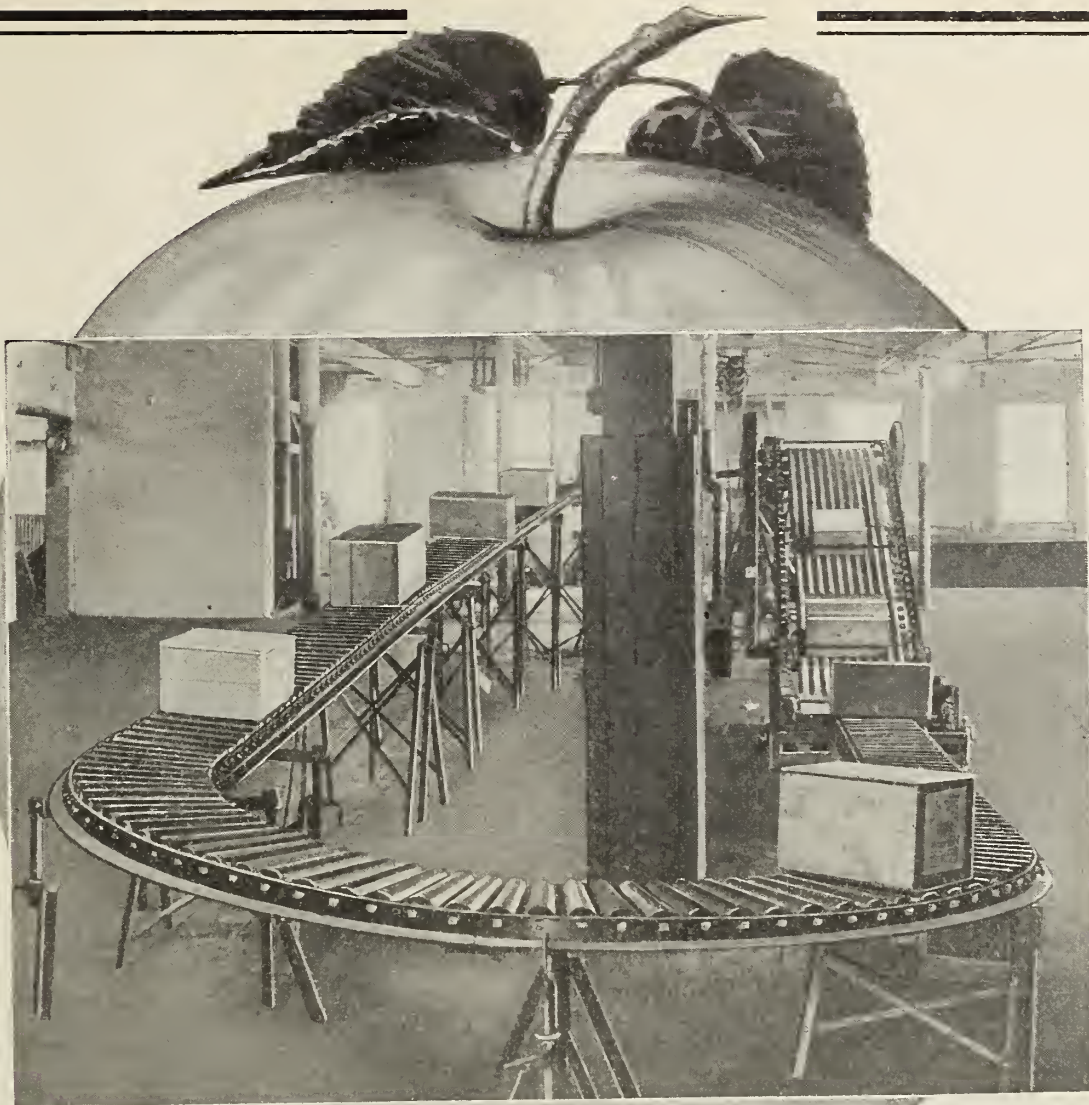
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# BETTER FRUIT

An Illustrated Magazine Devoted to the Interests  
of Modern Fruit Growing and Marketing.

Published Monthly

by

**Better Fruit Publishing Company**

703 Oregonian Building  
PORTLAND, OREGON

## Spray-Covered Apples.

Mr. Dwight Woodruff, Eastern representative of several of the large Northwestern apple growers' associations, is issuing a timely warning to growers to exercise more care in order to avoid having an excessive amount of spray on the fruit. A portion of Mr. Woodruff's letter in regard to this was recently published in the excellent little bulletin which is now being issued monthly by the Yakima Fruit Growers' Association, and was occasioned by the action taken by Boston health authorities last winter who condemned several carloads of Northwest apples on account of the excessive amount of arsenate of lead spray on them. In discussing this subject Mr. Woodruff says:

"I think it is something that should have your early attention at the present moment, because I have talked with different factors in the East on this very subject and they all seem to think that the federal health authorities and the various boards of health throughout the country, especially in the big markets, are going to be on the lookout this season, and we might just as well plan to avoid trouble. All of this is to advise you so that you will not ignore the situation, and do not think for a moment that this is a Boston matter, because it is not."

To growers who do not wipe their apples before packing this is an important matter, notwithstanding the fact that experiments by experts have demonstrated that the number of apples that would have to be eaten to cause injury or sickness on account of the spray on them is beyond the consumption of any one human being. The point of the matter is in the fact that Eastern health authorities look on the substance left on the apples as highly poisonous and have evidently decided to discriminate against them if they are discolored by an excessive amount of spray material. With the keen competition that is now arising in the East from Eastern growers who admit that the markets for fancy apples are being taken away from them by the superior pack and finish of Western fruit, the Western grower should leave nothing undone to place his fruit on the market in the finest of conditions. It is easy to understand how a campaign against Western apples could be inaugurated by having the health authorities or others whose purposes would not be so altruistic declare that they were poisonous or unhealthy.

The safest plan will of course be to have the fruit wiped, but if this is not to be done, then Mr. Woodruff's suggestion of avoiding the excessive use of spray should be adopted.

## By-Products.

Notwithstanding the very profitable prices received for fruit in the Pacific Northwest during the past two years, economy in production and handling has not received the attention it should have. In many instances prices for all kinds of fruit have ruled so high that growers have disregarded this element, which is so closely adhered to by other business enterprises which have figured out a way of handling or processing every part of raw materials.

While fruit growers are putting into use practices that are more and more reducing the handling cost of fruits, there is still room for a greater utilization of fruit by-products of all descriptions, and no fruit raising community which has any considerable degree of tonnage should be without its by-products plant. In many sections of the Northwest this phase of fruit raising is being taken care of by associations and private enterprises and this year will see the greatest quantity of fruit by-products of all kinds marketed in the history of the industry.

Figures given out by some of these plants for their last year's business show that even some of the parts of fruits heretofore regarded as pure waste, such as berry and apple pulp, when slightly reprocessed brought returns that were almost as profitable as the sale of the fresh fruit. Fruit growing communities, therefore, who are not familiar with this new innovation in the fruit industry should investigate what is being accomplished in this line in a number of the sections of the Northwest, more particularly in Western Oregon and Western Washington, and look to the establishing of one of these plants, which have become a most valuable asset in disposing of cull fruit and fruit-waste heretofore regarded as useless.

## The Coming Fruit Crop.

Although reports are to the effect that the deciduous fruit crop of the Pacific Northwest will be nearly as large as it was last year, an analysis of these reports and investigations as to the actual conditions leads to the belief that the output will be far less than it was in 1919. In some districts the crops of fruit have been cut down almost a third and in others there will be scarcely any

fruit at all of some varieties. This is true of the soft fruits particularly. In some of the large apple growing districts also the damage by the freeze last winter was severe. In one well known apple growing section that last year marketed 2,500,000 boxes it is now estimated that the maximum crop that can be expected will be 1,500,000 boxes, while many of the other districts show a decided "spotted" condition.

Not until several weeks have passed will it be possible to know approximately what the tonnage to be shipped this year will be and guesses and misleading statements in regard to it should be carefully avoided. Early impressions in regard to crop prospects that are erroneous cause a false situation to arise between producers and buyers, and an unstable market.

The indications now are, taking the crop of all kinds of fruits in the Northwest as a whole, that there will be a large tonnage to market, but that it will not approach in magnitude by many hundreds of carloads the crop of the past year.

## Packing Houses and Equipment.

In these days when the fruit industry is growing so rapidly in importance and necessity has stimulated the demand for labor-saving appliances of all kinds, the fruit grower should not neglect to get into touch with new equipment of many kinds that is being put onto the market and that means the saving of many dollars. This is particularly true of equipment for the handling of fruit in the packing house. Conveyors, graders, truck and other appliances are constantly being improved, giving to the grower greater facilities in the saving of time and money.

In almost every fruit raising center will be found dealers who are handling this equipment, and although you may think you do not need anything in this line it will pay to drop around occasionally and see what they have to offer.

New designs and features in packing houses are also being incorporated into almost every section of the Northwest this year where these buildings are being erected, and valuable information can be obtained from a visit to one of these structures in course of erection.

## Distributing Irrigation Water In An Orchard

INVESTIGATION by experts of the United States Agricultural Department shows that in irrigating orchards by the furrow method the length of lateral ditches or furrows should be governed by the size of the orchard and character of the soil. These investigations point to the fact that it is doubtful if it ever pays to run water in furrows more than about 600 feet. Where the soil is open and water sinks readily through it, short furrows should be used, otherwise much water is lost in deep percolation on the upper part of the tract. Professor H. Culbertson of California, after a careful investigation

of this subject has reached the conclusion that on sandy or gravelly soil having a steep slope the proper length of furrows is 200 feet, whereas on heavier soils and flatter slopes the length may be increased to 600 feet.

The grade of furrows varies quite widely. In flat valleys it often is not possible to obtain a fall greater than one inch to 100 feet, whereas on steep slopes the fall may reach 20 inches per 100 feet. On ordinary soils a grade of three to four inches is to be preferred, and where the fall exceeds eight to ten inches to 100 feet the trees should be



set out in such a way as to decrease the slope of the furrows.

The number of furrows in orchards should depend on the age of the trees, the space between the rows, the depth of furrow, and the character of the soil. Nursery stock should be irrigated by one or two furrows and young trees by two to four. A common spacing for shallow furrows is two and one-half feet, but deeper furrows are three to four feet apart. The general trend of orchard practice is toward deep rather than shallow furrows, a depth of eight inches being used in many instances.

In spacing furrows chief consideration should be given to the lateral movement of moisture in the soil on each side of the furrows, so as to insure a fairly uniform distribution of moisture.

In the Payette Valley, Idaho, 200 or more miner's inches are turned into the head ditch and divided up by means of wooden spouts into a like number of furrows. On steep ground much smaller streams are used. The length of the

furrow varies from 300 feet on steep slopes to 600 feet and more on flat slopes. The time required to moisten the soil depends on the length of the furrow and the nature of the soil. In this locality it varies from three to 36 hours.

A 20-acre orchard tract under the Sunnyside canal in the Yakima Valley, Washington, is watered four times in each season with 14 miner's inches (0.35 cubic foot per second.) Three furrows are made between the rows, which are 40 rods long. The total supply is applied to one-half the orchard (ten acres) and kept on 48 hours.

On the clayey loams of the apple orchards on the east beach of the Bitter Root River, Montana, Professor R. W. Fisher, formerly horticulturist of the agricultural college of Montana, has found, as a result of experimenting, that it requires from 12 to 14 hours to moisten the soil in furrow irrigation four feet deep and three feet sideways.

The fourth table shows the comparison of two adjoining Winesap orchards on similar soils and on clean cultivated ground.

Well Thinned—950 boxes 4½ tier and larger and 50 boxes five tier.

Poorly Thinned—500 boxes 4½ tier and larger and 500 boxes five tier and smaller.

Figured in actual money loss per 1000 boxes it varies from \$152.50 in the case of the Jonathan orchards to \$535.60 in third table. Add to this the additional cost of handling the smaller apples because of there being more of them, the loss is still greater.

Another fact which might be brought out is that the larger apples invariably run a higher percentage to extra fancy than do the smaller apples. Following are figures from two orchards in the comparison tables showing some interesting figures. In the well thinned orchard the packout was:

Seventy-three per cent extra fancy; 10 per cent fancy and 17 per cent C grade.

In the poorly thinned orchard we have: 47 per cent extra fancy; 27 per cent fancy and 26 per cent C grade.

Later it was found that all the "fancies" had to be marked C grade on account of lack of color, making a total of 53 per cent C grade apples. The loss in the second orchard amounts to \$330.

The loss in money due to small fruit during the past year is the least item to be considered. The reason for the small fruit as shown in the tables is due to

## A Practical Demonstration of Fruit Thinning

By C. A. Noren

NOW that the apples are packed and sold it is easy to obtain facts and figures relative to the value and advisability of thinning apples.

I have obtained four sets of comparisons of well thinned and poorly thinned orchards.

In three cases the orchards adjoin each other so that the conditions under which they were grown are very similar. Further, these figures were obtained from four different warehouses and therefore should be representative. The tables were figured on a basis of 1000 boxes to make the results more comparable.

The first comparison is that of two adjoining orchards, Jonathans, both of them well cultivated.

Well Thinned Orchard—990 boxes of 4½ tier and larger apples; 10 boxes of five tier apples.

Poorly Thinned Apples—675 boxes of 4½ tier and larger apples; 170 boxes of five tier apples; 155 boxes jumbles. The Jonathan being medium sized, these is no excuse for having so many small apples from this orchard. The owner did not think it paid to thin.

Table two is a comparison of two adjoining Winesap orchards on similar soils.

Eight hundred and twenty-six 4½ tier and larger; 77 boxes five tier, and 97 boxes jumbles.

This orchard had better than the average thinning.

Three hundred and eighty-seven 4½ tier and larger; 315 boxes of five tier and 298 boxes jumbles.

A poorly thinned orchard. From the above table it will be seen that the fruit runs 86.6 per cent 4½ tier and larger in the well thinned orchard as against 38.7 per cent.

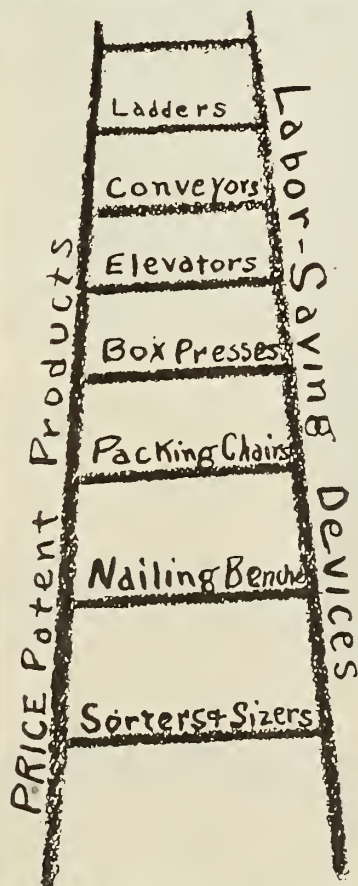
The third table is that of two Winesap orchards not adjoining each other but on similar soil and both in alfalfa.

Well Thinned Orchard—963 boxes of 4½ tier and larger; 20 boxes of five tier and 17 boxes jumbles.

Poorly Thinned Orchard—200 boxes 4½ tier and larger; 447 boxes five tier and 353 boxes jumbles.

The first orchard runs 96.3 per cent 4½ tier and larger as against 20 per cent in the latter.

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the fact that the trees bore too many apples, or, in other words the trees were not properly thinned. It is a known fact that it requires greater effort on the part of the tree to mature the core of the apple than the edible portion. It must then follow that a tree can mature with less effort ten boxes of apples averaging 150 to the box than ten boxes averaging 200 to the box. A tree can properly mature a certain amount of fruit and anything over that will cut down the size of all the fruit as well as the quality.

If a tree overbore this year, due to lack of proper thinning, more fruit spurs bore fruit than was actually necessary. This put too great a strain on a large number of fruit spurs and as a consequence they did not set the necessary fruit buds for next year, and further, the trees did not make the normal growth. Now then, it can readily be seen that the possibility of heavily loaded trees this year having a normal crop next year is small.

#### Alternate Bearing

Now we have arrived at one reason for the alternate bearing of fruit trees which applies especially to the apple. Taking a period of ten years the most profitable orchard is the one which bears an average crop every year. The alternate method of bearing fruit requires about the same amount of care and expense on the off year as it takes to bring through a full crop.

A tree has its limitations in the amount of fruit it can bear just as

much as a man is limited in the amount of work he can do.

The real loss by allowing the tree to overbear one year comes the following year when a short crop is the result.

Overbearing retards normal growth of trees.

Overbearing one year does not give the tree a chance to set fruit buds the following year.

#### Orchard Heating

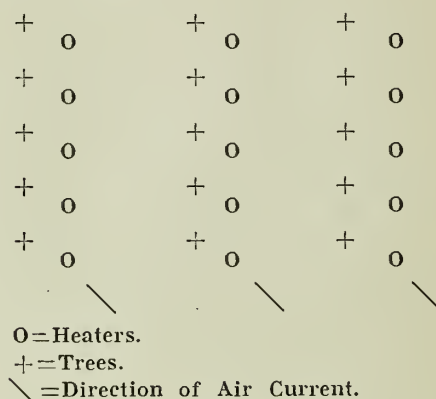
By C. K. Neilson, Paonia, Colorado

Editor BETTER FRUIT: I have been reading with much interest Mr. Calvert's article on orchard heating in your February issue. I have successfully practiced orchard heating for several years and I shouldn't consider fruit growing a sound business proposition without it. Fruit growing, like any other business, must be run to capacity in order to pay.

I should like, however, to take issue with Mr. Calvert in regard to his arrangement of heaters in relation to the trees. We place our heaters just as close as possible to the trees without danger of burning them, giving each tree its own heater. We tried the other method and found that by having the heater in the center of the square on very still nights, which are the most dangerous, the heat went straight up between the trees. According to our plan the heat goes up into each tree, and, there always being at least a slight motion of the air, we can see the smoke

gently distributing itself all through the tree, and naturally the heat follows the same course.

I may state that we use crude oil. It is, in my estimation, the only practical fuel. All coal heaters have been abandoned here on account of the excessive labor required, and the impossible labor required of regulating them in any way. This is the way I set my orchard heaters:



#### Combating the Strawberry Weevil.

Thousands of dollars damage is done annually to strawberry beds by the strawberry weevil. This insect cuts the blossom stems so that fruit does not develop. This trouble can be entirely overcome by dusting with sulphur dust and arsenate of lead at the rate of one pound of lead arsenate to five of sulphur. Make two applications a week apart when the insects first appear.



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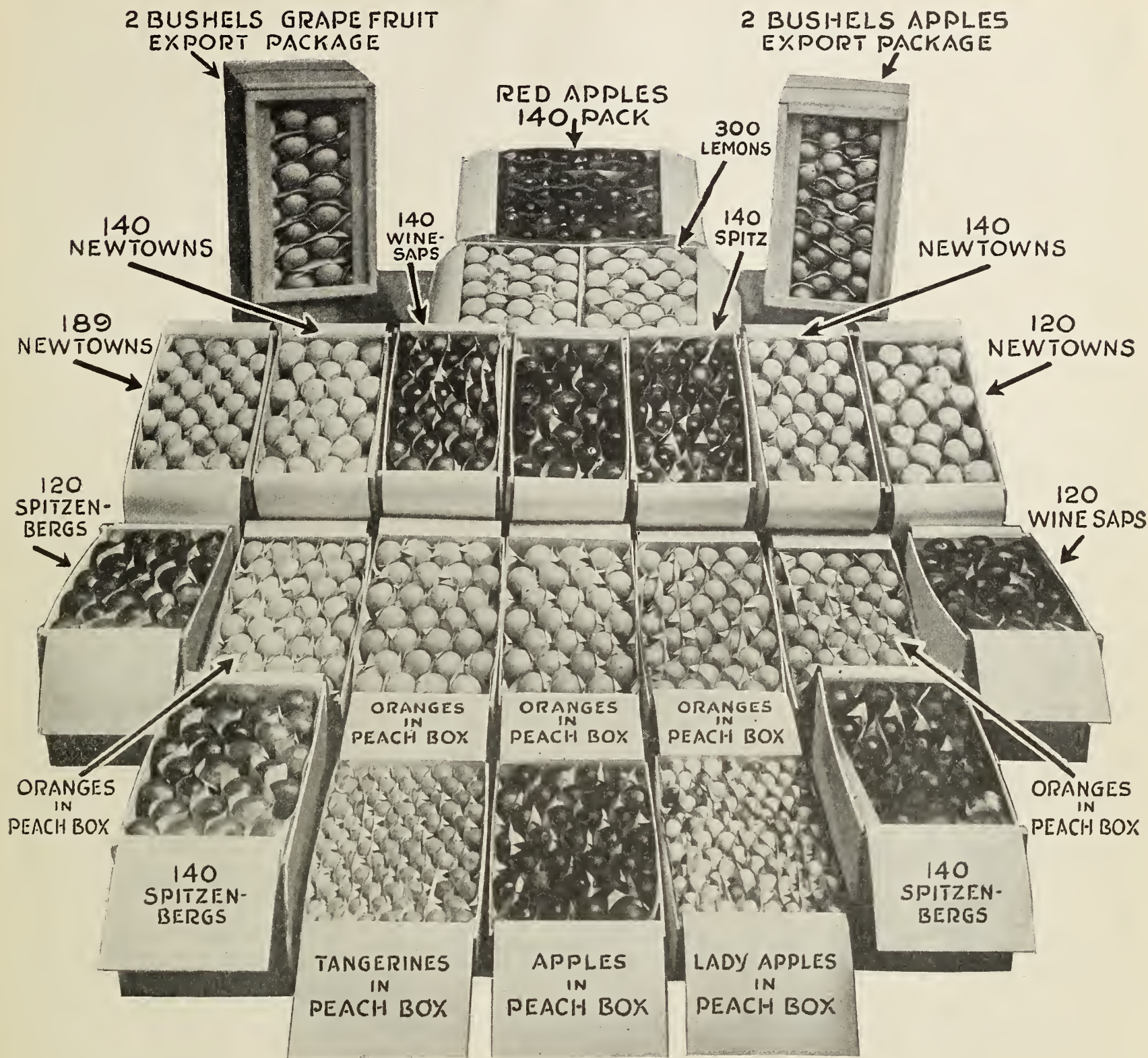
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## Northwest Fruit Notes from Here and There

### OREGON

To reduce the cost of packing apples this year the Hood River Apple Growers' Association has decided to discontinue having fruit wrappers printed. The saving to be effected by this change it is estimated will be \$15,000 to the members of the association. Apple packing paper will cost the association this year \$150,000.

Reports from Cove are to the effect that the cherry yield in that district is very promising. While the freeze last winter did some damage a yield of 50 per cent is expected from old trees and 100 per cent from young trees. As in other districts the freeze affected old trees more seriously than young ones.

Roseburg is believed to have had the distinction this year of reporting the first ripe strawberries grown in Oregon. On May 7 two growers reported berries that were ready for the table.

The 1919 prune crop at Dallas was cleaned up recently by the shipment of nine cars to Eastern markets. During the latter part of the season the packing plant at Dallas processed 3,600 boxes of prunes daily.

Plans were recently put on foot in The Dalles to re-finance the Kings' Products Company, which operates dehydrating plants in the above named city and also at Salem and Portland. To bring this about a meeting was held by the Chamber of Commerce of The Dalles which agreed to endeavor to float \$150,000 worth of the stock of the company. Salem is being asked to take a like amount of the stock while Portland interests have agreed to furnish the rest of the capital required. The total amount involved in the re-financing of the company is \$1,000,000.

Dan Wuille & Company, the English apple exporting firm which already has extensive connections for the marketing of apples in Oregon, will erect warehouses in that state and in Washington this year which call for an expenditure of \$100,000. The warehouses are to be built at Underwood, Washington, at Odell, in the Hood River Valley and at Newberg, Oregon.

The first Oregon strawberries to be put on the market at Salem sold for 35 cents for a 12-ounce box. They were of the Oregon variety which was originated near Salem.

Frost damage in the Medford district this year was reduced to the minimum. Although growers in that section had their smudge pots ready there was very little use for them. Reports from Medford state that prospects for all fruit is promising although the crop is not expected to be as large as that of last year.

The Puyallup and Sumner Fruit Growers' Canning Company, which had been competing with other firms for loganberries in the Salem district, recently announced that it had temporarily withdrawn from the field, owing to the high prices being asked by growers for fruit and also on account of the soaring prices of sugar.

### WASHINGTON

Profiting by the experience of growers in some of the other districts in Washington, Yakima County has organized a spraying district comprising 1,000 acres of land and has employed an inspector who will devote all his time to spraying problems. To pay the expense each member of the district has agreed to pay \$1.00 per acre for the work.

The Perham Fruit Company, located at Grandview, has authorized work to be begun on a cold storage plant at that place which will have a capacity of 250 cars. The plant will cost \$100,000 and will be 125 by 150 feet, two stories high and basement.

A report from the Mabton district says that warmer spring weather shows that few of the soft fruit trees were killed in that district by the freeze last winter but that the crop will be light.

The White Salmon Valley, one of the earliest berry districts along the Columbia River, shipped its first berries May 12. The berries brought \$12 a crate. Kennewick, which usually ships the first strawberries from the Columbia River district is reported to have been one day behind White Salmon this year in making its first shipment.

Selah reports that the pear crop in that section will be heavier than was at first expected, the freeze last winter not having done as much damage as was at first thought.

Reports from the Wenatchee district is to the effect that the fruit crop in that section this year will be as large, if not larger than that of last year. Local bankers who are looking into

the matter of financing the crop state that they look on the situation as very promising and will be able to handle all legitimate requests for loans.

It is estimated that canners in Washington will get more than one-half of the strawberry crop of that state at prices running from 15 to 20 cents in the field. Canning berries at Kennewick have been sold for 15 cents, in Western Washington for 18 cents and in the Puget Sound country for 20 cents. At the present time canners have been forced to reduce their offers owing to the sugar situation.

To relieve the car shortage situation in the Wenatchee district this year it has been proposed to utilize the Columbia River and ship by boat. To do this an expenditure of \$35,000 it is stated would be necessary to open a channel through the rapids below Wenatchee. By doing this the Chicago, Milwaukee and St. Paul Railroad could be reached by a comparatively short trip on the river.

A report from the Yakima Valley says that while pear trees in that section showed a mass of bloom, the blossoms dropped off quickly, causing growers to believe that they were blighted. Other districts in Washington report a similar condition and it is now expected that the pear yield generally in that state will be extremely light.

The Duddy-Robinson Company of Yakima, has taken out a permit to erect an \$80,000 cold storage warehouse, on which work will begin at once. H. C. Nead has been given the contract.

"The fruit industry of the Northwest already is paying its full share of the revenues needed by the railroads. If it can be established that such is not the case, the fruit growers are ready to carry their additional share, but the increase should be a horizontal one, based on cents per hundred pounds, and not a percentage increase. Treat fruit as wheat, lumber and cotton were treated." This statement sums up the attitude of Northwestern growers on the proposed 25 per cent increase in freight rates on fruits as expressed at the Portland conference, according to C. J. Webb, secretary of the North Pacific Fruit League. A 25 per cent increase means an increase of 12½ cents in the freight bill on every box out of the Northwest. On eastern apples, it means two, three or four cents. It is declared that Northwestern apples now are virtually shut out of some eastern markets until the eastern apples are sold because of the rate discrimination.

A definite decision has been reached by the Wells & Wade Fruit Company to construct one of the largest and most modern fruit warehouses in the Wenatchee district this summer, in time for the fruit shipping season of the fall. It will have a storage capacity of 200 cars of apples. The building will be arranged so that it can be equipped as a cold storage warehouse later.

The Skookum Packers' Association has set its goal this year at 10,000 cars of apples, as against 6000 in 1919, according to P. H. Parks, general manager of the Association. Its membership now includes 35 cooperative fruit shipping organizations and large growers of the Northwest, of which the Spokane Fruit Growers' Company is the largest. "We believe 1920 is going to be a great year for the cooperative organizations," says Mr. Parks. "The cash buyers were hard hit last year and are going to be wary this season. The growers realize that some of their fruit last year was sold for more than it was worth and they do not expect that condition to continue."

A deal has been consummated for the purchase of all assets of the Cashmere Apple Company by A. H. Bohlke, principal owner of the Bohlke Fruit Warehouse Company of Dryden. Mr. Bohlke takes over the two modern warehouses owned by the Cashmere Apple Company at Cashmere and Wenatchee, also real estate contracts covering some of the most productive and highly improved bearing orchards in the Wenatchee Valley. The consideration was \$185,000.

J. W. Wickers, manager of the Highland Fruit Company of Kennewick, is reported to have closed a deal for the sale of his 1920 apple crop at prices that are an advance over those received last year.

### IDAHO

Apple trees in the Boise Valley of all descriptions are reported to have blossomed heavily and good crops of this fruit are now anticipated. A good yield of cherries and

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prunes is also expected. The yield of peaches and apricots is expected to be light. Spring frosts caused very little damage in this region this year and growers are reported to have been unusually busy in taking care of their orchards.

It is announced that a new addition will be built to the plant of the Buhl Canning Company in time to take care of the largely increased business expected this year.

In honor of the men who were members of the Idaho Technical School, who gave their lives for their country in the world war, trees were recently planted on the school ground at Pocatello.

By buying lime-sulphur solution in large lots this spring fruit growers in Boundary County estimate that they saved from \$3 to \$5 per barrel.

In order to test out the use of commercial fertilizers orchardists in Washington County will conduct a test on 22-year-old prune trees. One thousand pounds of a combination commercial fertilizer will be used on one plot and 200 pounds of nitrate of soda on another to test their comparative merits. Tests will also be made with apple trees.

Payette citizens are endeavoring to have a box factory located at that point. The proposition was started by the offer of A. J. Wilson to the local Commercial Club that if the citizens of the county would subscribe for \$10,000 worth of the stock the building would be erected before the payments on the stock are asked for.

Director W. H. Wicks of the Idaho State Agricultural Department is conducting a vigorous campaign this spring to have all fruit orchards in the state properly sprayed and to secure a uniform inspection system of pest inspection. Samples of spraying solutions used by growers will also be collected by the department and sent to the state chemist for analysis to determine whether they are up to the standard. The fruit inspectors who will work with the department this year are: North of Payette, A. S. Worth; Fruitland, east of Penn's Avenue, J. D. Baker; Fruitland, west of Penn's Avenue, L. E. Keeler; New Plymouth, H. T. Lewis; Payette, Washoe Bench and all nursery stock; Weiser district, A. R. Albee.

A two-story warehouse, 45 feet by 200 feet, to cost approximately \$25,000, is planned for Coeur d'Alene, Idaho, this summer by the Spokane Fruit Growers' Company as headquarters for the apple tonnage of the district and for the supplies handled by the company through its Coeur d'Alene branch. The growers interested at present represent 1,000 acres of orchard. The company expects to sign up 150 cars of apples this season to justify the erection of the new warehouse.

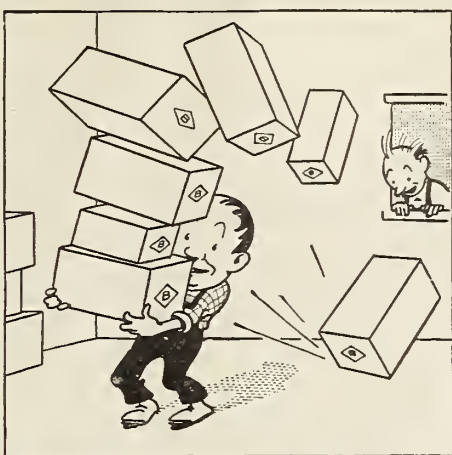
Examination of cherry trees in the Lewiston-Clarkston Valley shows almost no damage from frost and all signs point to a bumper crop in that section. During the last few years shipments of Bing, Lambert and Royal Ann cherries and sales to local canneries, have increased to a point where this fruit is one of the most dependable and profitable raised in Lewiston-Clarkston Valley. Growers are offered 10 cents a pound for canning cherries at present, but it is generally believed that competition for the local crop will bring the price above this. Consequently growers are not contracting to any extent.

Examination of fruit buds on apple trees in Lewiston Orchards indicate a light crop, due to the severe winter. Damage from scale has been almost completely done away with by continuous spraying. The freezing weather of last December tended to kill most of the scale and the trees are now in better shape than ever before. Nut crops will be small this year, but cherries and pears are promising in that section. Peaches have been seriously damaged.

### What They Are Doing in California

The California Prune and Apricot Growers' Association has commenced the erection of a new packing plant at Reedley. This is the first plant of the association in this part of the valley.

A recent survey in the Linden and Bellota sections of the eastern part of San Joaquin County shows that there are 9,700 acres planted to fruits, nuts and grapes in that district. Some of the finest quality peaches that are grown in California come from this dis-



Boxes large and boxes small;  
Boxes short and boxes tall;  
And every box  
Withstands its knock,  
For they're "B-D" built—  
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Selected spruce and hemlock,  
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safely are met quickly. May we have your next order?

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triet. Other fruits that are grown there are apricots, pears, peaches, grapes and prunes. One of the largest walnut orchards in the world is located there. This orchard is 500 acres in extent and is three miles west of Linden.

More than 800,000 almond trees will be planted in San Luis Obispo County this year. Only the shortage of stock prevented the plantings from being much more extensive.

Two hundred thousand fruit trees of different varieties have been set out in Stanislaus County this season. Prospects of a greatly increased yield of fruits from old trees is being anticipated by the local canneries which are building additions to their present plants to take care of the increased production.

The apple production at Watsonville last year was one of the largest in the history of

## Timely Topics and Advice for Fruitgrowers

Many growers says W. L. Close, horticultural inspector in Washington, who want grafting or budding done and who are not familiar with this phase of orchard work, neglect to get their scions until it is too late in the season. When a grower is planning on working over fruit trees he should locate some good thrifty trees of the variety he wishes to use for scions and make definite arrangements early enough to be sure of the best stock. It is better to cut the scions before pruning, but if this is not possible those from the prunings will do if gathered before they are dried out. Scions should be selected from good healthy last year's stock, but not from water sprouts of too rank a growth. This season growers should be especially careful to get scions as free from signs of winter injury as possible.

If your orchard is being attacked by apple aphids and you neglected to spray for them during the green tip period a later treatment is possible by the addition of nicotine sulphate one pint to each 100 of arsenate of lead or the same amount of nicotine sulphate to each 100 gallons of dilute lime-sulphur (1 to 40.) This should be applied about three weeks after the petals fall.

Ravages of the apple leaf hopper can be materially checked by a single spraying of 40 per cent nicotine sulphate in the proportions of 1 to 1,500, combined with soap. The solution should be applied against the first brood nymphs, the time being governed by whether the growing season is early or late.

W. L. Adams, a Zillah, Washington, strawberry grower, who has made a marked success of growing strawberries, in planting sets the plants in rows two feet wide and five feet apart, removing all the first buds from the slips and then turning the runners in the rows toward each other. The runners are kept thinned out making large sized slips and a large yield of fruit buds. The plants are reset or worked to new slips every third year.

If the fruit buds on your peach trees have been endangered during the winter by low temperatures it will be advisable to delay pruning until settled growing weather determines their conditions. This is especially advisable if heavy heading in of the previous season's growth is involved. The proportion of live buds will determine the extent to which the cutting back is necessary. In summer pruning the peach the trees should be observed constantly. Whenever a branch is seen that is so placed that it will need to be pruned at the heavy pruning time it should be taken off at once, thereby allowing more vigor to go to the rest of the tree.

In discussing the subject of thinning apples Gordon G. Brown, horticulturist at the Hood River Experiment Station, advises that the aim of the grower should be to secure a maximum crop of best quality apples each year rather than to sacrifice fruit with the idea of insuring larger crops in subsequent years. Mr. Brown bases his advice on his own observations and that of other experts who have secured data that indicates that excessive thinning to induce more regular annual bearing does not in all cases accomplish its purpose. "This is not," he says, "to suggest that no influence is exerted on subsequent crops by thinning, since such an inference would be manifestly unreasonable and contrary to general experience. If a tree is allowed to overbear it nearly always exhibits a tendency to short crops and weakened vitality especially during the following year. On the other hand

the Pajaro Valley. Figures that have recently been given out show that 2,719,000 boxes of fresh fruit was packed out; 5,500 tons of dried apples put up; 2,100 tons of green apples canned and 60,000 boxes of apples used for cider.

At a meeting of the nurserymen of California recently held at Sacramento, called by George H. Hecke, director of the State Department of Horticulture for the purpose of discussing the standardization of the propagation of tree fruits it was decided to only propagate the varieties of fruit that the markets demand. The nurserymen in attendance at the meetings reported that the demand for nursery stock is unprecedented and bids fair to continue for some time. For this reason the California Nurserymen's Association has decided to keep the cost of propagation down to the lowest point by the elimination of undesirable varieties of fruit stock.

the point which it is desired to bring out is that there is little to support the idea that more regular annual bearing can be established by removing more fruit than the tree is capable of growing of the best quality. As a rule it is doubtful if a tree can mature even one fruit to every spur. This would apply particularly to older trees and less so to young ones. However, in few cases is the tree called upon to carry such a heavy burden. In many cases a good crop is insured if one spur in three or four bear."

### Bits About Fruit, Fruitmen and Fruitgrowing

A report received from Middlesex County, Massachusetts, where growers have adopted the box pack is to the effect that large acreages of apples have been planted in that section during the past ten years. Some of the principal varieties grown are the McIntosh Red, Gravenstein and Baldwin. These varieties of apples from this section during the past season are reported to have brought from \$4 for extra fancies to \$1.75 for windfalls.

The Hood River Glacier reports that the cost of packing apples will soar this coming season. While the box market is still indefinite, indications point to 30-cent box shooks, as compared with an average of 18 cents last year. Growers will pay from 12½ cents a pound, for layer boards, to 17 and 18 cents for light weight wrapping paper for papers for their boxes this year. These prices are from 25 to 50 per cent higher than last year. The labor situation for orchardists is improving. While growers were finding it difficult two weeks ago to obtain men, an influx of new workers has struck the valley and the help supply now is fairly plentiful. Growers are paying from \$80 to \$100 a month.

Australia, May 19, put into effect an order removing the embargo against the importation of American apples. The prohibition against the importation of American apples was put into effect July 18, 1917.

According to reports from British Columbia jam plants in the strawberry growing districts in that province have contracted with growers this year for 250 tons of berries at 20 cents per pound, or three cents higher than the price paid last year.

The Package Sales Corporation, which manufactures basket containers for fruit has recently issued a booklet on how to load cars properly. The booklet contains a number of illustrations showing how to load and how not to load with explanations that are valuable to growers using this kind of a container. A copy of the booklet can be obtained by application to the company whose place of business is at South Bend, Indiana.

Falling in line with western packing and marketing methods New York apple growers are forming coöperative marketing associations to fit eastern conditions. Three of these associations have been formed in Monroe County, one of the heaviest apple growing districts under the direction of the County Farm Bureau.

The engineering department of the Cleveland Tractor Company is distributing a pamphlet treating on the proper method of laying out fields for tractor plowing. The pamphlet will be found useful to orchardists and others having occasion to use a tractor in plowing. It



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have been fatal to the financial success of many men and women; and the tragedy of it all is that if they had consulted their bankers it might have been avoided.

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is illustrated in a comprehensive way and can be obtained by applying to agents of the company.

A new volume entitled "Productive Small Fruit Culture," the work of Fred Coleman Sears, Professor of Pomology Massachusetts Agricultural College, and published by the Lippincott Company, has recently come from the press. Without being technical the work covers the subject from a highly intelligent point of view. Numerous illustrations show the many phases of growing, cultivating and packing small fruits and in many respects the volume will fill a demand in the fruit growing world as a ready reference book on the successful growing of small fruits.

Proposed increases in freight and express rates will increase the shipping bills of fruit growers in Washington and Oregon this year more than \$10,000,000, according to figures submitted at a meeting in Spokane of the executive committee of the North Pacific Fruit League. Walla Walla, Yakima, Wenatchee, Hood River and Spokane districts were represented. The league will wage a vigorous fight against all increases proposed. The 1919 apple crop of the four Northwestern states, it was pointed out, was 30,000 cars and of all fruits about 40,000 cars. There is every indication now that the 1920 crop will be as large. J. G. Wilson, of Portland, counsel for the league, has compiled figures showing that the 1919 freight bill of Washington and Oregon alone was approximately \$19,000,000 on apples, peaches and pears.

Fruit growers of the Wenatchee district, comprising Chelan, Okanogan, Douglas and Grant Counties, it is reported will have to pay nearly \$2,000,000 more for boxes, paper and nails used in the packing of this year's fruit crop than was expended by them in 1919. Within the last few days several big contracts have been signed up at prices ranging from 28 to 30 cents. Spruce boxes will sell to the grower at 28 cents under these contracts and pine boxes at 30 cents for the heavy dimension shooks. Some sales have been made at slightly less than the above figures, and hemlock boxes are now offered at about one cent below the price quoted for spruce. These prices are double what were prevailing one year ago today. If the total fruit crop of the Wenatchee district holds up to last year's figure with the natural increase resulting from the increasing bearing capacity of the trees, there should be 10,000,000 boxes of fruit packed out this year. That would mean a total cost to the grower of about \$3,000,000 for boxes. This compares with about \$1,500,000 last year. Wrapping paper presents a still more serious problem for the growers than does the box question. Wholesale houses and mills that formerly bid for this business are absolutely refusing to take orders for more than a portion of the amounts they usually sell. One large dealer was informed by the firm which has always supplied all its paper that only 60 per cent of the local dealers' requirements could be shipped this year.

### Cannery Notes

The operations of the Bitter Root Canning Company in the Bitter Root Valley, Montana, are being extended this year by the purchase by J. W. McKinnon, Jr., manager of the cannery of 150 acres of productive land which will be planted to green peas. The company expects this year to put up 2,000 cases of peas or double the pack of last year.

The Oregon Growers' Cooperative Association recently closed a deal at Dallas, Oregon, with J. C. Shultz for a plot of ground along the Southern Pacific Railroad on which it will erect a packing plant to take care of the prune and other fruit crops which the organization will handle in that vicinity. It is planned to have a cold storage plant in connection with the new packing plant.

The Drager Fruit Handling Company, which operates in the Willamette Valley, Oregon, has commenced the erection of one of the largest fruit packing plants in the state at Roseburg. The new plant will be 160x50 feet with an annex. The main building will be three stories high and will cost, with improved equipment that will be added, \$25,000. V. T. Jackson, the local manager of the plant says that it is expected to have it entirely completed by September.

The Graves Canning Company, which recently purchased the string of canneries owned and operated by the Brownsville Canning Company announces through its head, Roy Graves, that

it is the intention of the company to pay more than the contract price for fruits to growers in case prices advance during the coming season. The company is now endeavoring to make contracts with growers for a term of five to eight years. Fifty additional acres are being put into berries in the Brownsville district this year and it is expected that 300 acres will be planted next year.

A trade interest of note is the fact that the British Board of Trade recently removed the export embargo on canned cherries. At the present time other canned fruits may be exported only under license.

The A. Rupert Company, Incorporated, which operates the largest number of canneries in Oregon, recently announced the election of Walter A. Frost, of Chicago to the presidency of that institution. H. F. Davidson, one of the largest fruit growers in the Hood River Valley was elected first vice-president and secretary, and D. C. Minor was appointed assistant to the president. Mr. Frost is the head of the Walter A. Frost Company of Chicago, one of the largest canned food and brokerage concerns in the middle west. He will make Portland his headquarters and following his election stated that the policy of expansion and coöperation with growers in the development of the fruit industry, adopted by the late A. Rupert would be continued. The program for expenditures for plant betterments and improvements this year calls for an expenditure of \$150,000 and the company expects to do a \$2,000,000 business in buying fruits in Oregon and Washington this year, provided fruit and sugar prices do not soar to a prohibitive figure.

Arrangements are being made for the installation of a by-products plant at Wapato, Washington, by the Sunset Fruit & Produce Company. The stockholders of the company recently agreed to an increase in the capital stock from \$10,000 to \$200,000 for improvements, the purchase of machinery and other equipment needed. The by-products plant will be housed in an added story to the large brick warehouse and packing plant which the company already owns at Wapato. The company proposes to manufacture all of the by-products of the apple, to make catsup, mince meat and other table foods and to install a mill for the manufacture of starch from cull potatoes.

The Idaho Canners Company, Incorporated, which has taken over the cannery at Payette, Idaho, is making arrangements to enlarge the building and re-equip the establishment with modern machinery that will permit the company to pack a complete line of fruits and vegetables. It has been actively engaged for several weeks in securing all the available fruit and vegetable tonnage for the cannery and will start the plant at the opening of the canning season. The new men interested in the cannery are F. M. Lane, Rochester, N. Y., and O. S. Pratt of Salt Lake. W. A. Coughanour and F. M. Ross, formerly with the old company are on the board of directors.

According to J. K. Armsby, president of the California Packing Corporation, the rising price of sugar will very materially increase

the price of California canned fruits this year and cut down the output. Mr. Armsby denies the statement that California canners had contracts for sugar covering a period of several years at prices less than are now prevailing and says that they have had to buy in the open market.

Sacramento canneries will turn out between \$14,000,000 and \$15,000,000 in canned goods this year, according to estimates. Libby, McNeill & Libby's Sacramento County plants have already put up 175,000 cases of spinach and 300,000 cases of asparagus. The canneries will pay approximately \$6,500,000 to growers and labor this year.

### Fruit as First Aid to Convalescence

"Two Tons of Oranges—the Gift of the Alhambra-San Gabriel Red Cross Chapter, to the Sick and Disabled Soldiers at Letterman Hospital, San Francisco. Your Turn Next!"

This legend in bold letters on the side of a two-ton auto truck advertised the merits of fruit as a first aid to convalescence over a circuit of five hundred miles, as the golden cargo made its way along the valley from the Southern California town on to the Pacific Coast. Newspapers all along the route gave a still wider publicity to the generosity of the fruit growers of the Sunset state for in addition to the oranges there were quantities of lemons and grapefruit, while at Los Angeles the local Red Cross Chapter added a contribution of seventy-five pounds of candy.

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A local packing house boxed the fruit for shipment free of charge and the use of the truck and driver for the long journey was contributed by a Los Angeles firm.

There was a unanimous response to the suggestion, "Your Turn Next," in every town where stops were made, all of which were referred to the Director of the Department of Military Relief of the Pacific Division Headquarters, Mr. Walter M. Case, who gave advice concerning the hospitals where such gifts would be acceptable. Not that there is any danger that fruit would ever come amiss, for the demand invariably exceeds the supply, but in order to insure

an equal distribution of the luscious food to every one impartially.

It is safe to say that in the cities where the principal stops were made the passage of the Red Cross Orange Van did more to make the housewives and restaurateurs think of desserts and salads in terms of fruit than the most tempting window displays or carefully worked out "psychological advertising appeals."

Wendell P. Chambers, an overseas man and member of the Alhambra Post, No. 139, was in charge of the truck and made the official presentation to the Red Cross Field Director upon arriving at Letterman.

## Some Brief Observations on Summer Pruning

SUMMER pruning is a subject on which there are many ideas. The well known statement of fruit men to prune in winter for wood and in summer for fruit, does not, according to Professor C. I. Lewis, always work to advantage. Summer pruning, according to this authority, may be for wood or it may be for fruit, the amount and time of pruning and the age and kind of trees being the determining factors in summer pruning. In discussing this subject further Professor Lewis says:

"Summer pruning for wood applies especially to the first three years of the tree's life, or, in some cases, to trees somewhat older that have been overpruned in the winter, and, if allowed to grow until the succeeding spring, will become too rangy. In summer pruning young trees I would suggest that very little of it be done the first year, the pruning this season to consist of the removal of undesirable buds and young shoots which, if allowed to grow, would take nourishment away from the branches that should be retained for the framework of the tree. This pruning should always be light in character. During the second and third years of the tree's growth some growers feel that they can gain an entire season by pruning in June, and to some extent this is true.

"As soon as the leading branches have made a growth sufficient to allow the proper formation of the second laterals, these leading branches should be pinched back; and in place of a strong terminal growth there will be secured lateral branches on each leader and by fall they will have made sufficient growth so that practically an entire season has been gained in forming the framework of the tree. The amount of this pinching or pruning back should depend upon the variety and the growth the trees have made. It is probably better if it can be done without removing large quantities of foliage. Some people believe that such removal devitalizes the tree. However, this is a point which is open for further investigation. Where the pruning is done early, as in May or June, such trees will have ample opportunity to harden up their growth sufficiently before winter.

"When we speak of summer pruning, most growers think at once that we mean only pruning to induce fruitfulness, and undoubtedly most of the summer pruning that is done has this one object in view. In glancing over the literature on summer pruning, one is impressed by the fact that there seem to be several theories.

"One is that summer pruning changes leaf buds into fruit buds. Another is that summer pruning causes the immediate formation of fruit buds. These theories are probably incorrect. With most varieties of pomaceous fruits, such as apples and pears, I doubt if summer pruning will give very immediate effects as far as the succeeding fruit crop is concerned. I am inclined to believe it will affect more the crop of the second and third years and will induce some of the younger wood to come into heavy fruiting earlier than otherwise.

"Probably in the case of certain stone fruits like peaches and cherries and those varieties of pomaceous fruits that bear on terminal buds on one-year-old wood, or even on the current year's growth, fruit may follow the pruning of such varieties. But we can also answer that you get this fruit if you don't prune. Until more careful experiments have been conducted and good checks are kept, it will be impossible to prove what summer pruning will do for such varieties. Many growers feel that with peaches it is an advantage to prune in early summer, not so much to induce fruitfulness, because the peach bears only on one-year-old wood on the one hand or too weak wood on the other does not give an even distribution of large fruits.

"In summer pruning of pomaceous fruits it has been noticed that such pruning thickens up the wood very materially, which means that there is an accumulation of tissue, and very apt to give rise to fruiting wood; but it will affect the spurs that are growing next year. If you examine the trees carefully at the time the summer pruning is done you will find that the fruit buds and leaf buds are already there. An accumulation of tissues, however, will in all probability strengthen the fruiting areas."

### Establishes String of Warehouses.

The American Fruit Growers, Inc., which last year acquired a number of large orchard tracts in the Northwest and is the largest orchard holding concern in the world, will establish a branch at Zillah, Washington. Other warehouses to be operated by the new concern in that state will be located at Yakima, Grandview and Selah.

### Valuable Reports.

The annual reports of the Washington State Horticultural Association, the Idaho State Department of Agriculture and the Western Walnut Association, recently issued, are of valuable interest in their respective fields. All of these reports contain much that the fruit and nut grower will find handy to refer to and study.



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fruits and vegetables, destroy the numerous enemies which attack them by spraying early and often with a MYERS SPRAY PUMP. Here is real protection — the kind that produces results and pays for time and effort expended for MYERS SPRAY PUMPS have been developed to meet the needs of all fruit growers and gardeners, and others who raise fruit or vegetables on the home lot. Large capacity Power Pumps and complete Power Rigs — Medium Capacity Tank and Barrel Outfits — Small Capacity Bucket Pumps and Atomizers, and a complete assortment of Nozzles and Accessories make up the Myers "Honor-Bilt" Line. Speed, ease of operation, correct and economical application of mixtures, better construction throughout with many patented features are Myers Talking Points.

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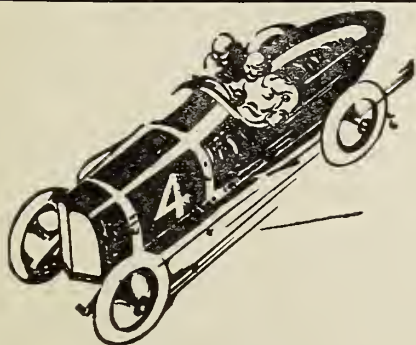


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## Birds—Their Practical Benefit to Horticulture

Continued from page 6.

saw martins feed their young 312 insects in 16 hours. Mr. Mosher made a record of a pair of yellow throat warblers eating plant lice in a birch tree at a rate of 68 a minute for 40 minutes. At this rate this one pair of birds would destroy 73,000 of these insects in a week.

Harvey found 500 mosquitoes in the stomach of a nighthawk and 60 grasshoppers in that of another bird of the same species. A scarlet tanager ate 35 gypsy moth caterpillars a minute for 18 minutes; a warbler ate 90 plant lice in a minute, and a pair fed at this rate for 40 minutes. A red-winged blackbird had 28 cutworms in its crop. Fifty-one species of birds are known to eat hairy caterpillars, and 38 species feed on plant lice. It is estimated that during the stay of the birds in New York state each season they destroy more than 3,000,000 bushels of injurious insects. Think of the consequences if the birds were all exterminated.

Is it worth while to try to save our forests, our shade trees, our fruit trees? If so, we must stop the killing of insect-eating birds. The gypsy moth, the brown-tail moth, the leopard moth, the elm tree beetle, and the tent caterpillar have killed millions of trees in the past few years, and today they are imperiling every tree on the continent!

The only way to check the increase of these insects is to stop the killing of insect-eating birds, and then let the birds increase to their normal numbers. Careful scientists tell us that if all insect-eating birds were destroyed, the whole continent would within three years become absolutely uninhabitable by reason of the myriads of insects that would spring up and devour every living thing. We are face to face with this possibility.

Ninety per cent of the normal bird life of this country has already been destroyed, and the other 10 per cent will go in the next five years unless drastic measures are employed to stop the slaughter. The farmers and fruit growers of this country are losing over \$1,000,000,000 a year by reason of the ravages of insects. Here are a few items in this appalling expense account.

The cotton growers of Texas are losing \$40,000,000 to \$50,000,000 a year by reason of the ravages of the boll weevil; and all because the quail and the prairie chicken, the natural enemies of that bug, have been practically exterminated in that great state. The cotton boll weevil is moving like a great army to the eastward and to the northward, and scientists sent down there to study the situation tell us it will go to the Atlantic ocean before it stops, and as far north as cotton is grown, unless the killing of birds is prohibited. The wheat growers of the United States are losing over \$100,000,000 a year by reason of the ravage of the chinch bug. Why? Because the quail, the natural enemy of that bug, has been almost exterminated. The farmers of the middle

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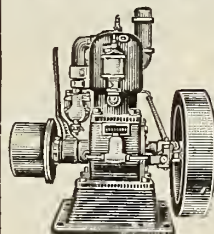
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and eastern states are paying out \$15,000,000 a year for Paris green to put on their potato vines. Why? Because the quail, the natural enemy of that bug, has been almost exterminated.

Each of the great apple producing states is paying \$1,000,000 to \$3,000,000 a year for spraying apple trees to keep down the codling moth. Why? Because the woodpeckers, the sapsuckers, the robins, the blue jays, the bluebirds, the orioles, the tanagers and other birds that formerly preyed on this insect have been killed off, and every man, woman and child who eats an apple or a potato helps to pay for this poison.

Of the 1,200 species of birds inhabiting the United States, about 335 visit Kansas; 175 of these nest in the state. In calculating some of the worth of

these birds to the state, we will use the Massachusetts estimate of five birds to the acre. Kansas, with her 51,200,000 acres, should have a bird population of 256,000,000. Insect-eating birds consume on a very conservative estimate 100 insects a day. Kansas birds would devour 25,000,000,000 every day (May to September, inclusive) for five months or 150 days.

That these figures can be better understood it has been computed that about 120,000 average-sized insects fill a bushel measure. This means that Kansas birds consume 213,333½ bushels of insects a day. Then for 150 days (five months) they would use a total of 32,000,000 bushels of insects.

Again, by Mrs. Nice's careful observation we are enabled to state that 10,000

average insects weight one pound, and that one bushel of insects weigh twelve pounds, so Kansas birds, from May to October (five months), eat 384,000,000 pounds of insects. This estimate is good for about five months of the year, May to September, inclusive. During the remainder of the year the insect eggs and larvæ destroyed by our late fall, winter and early spring migrants will be equivalent to half of this quantity. Kansas has a longer season than Massachusetts, and I will consider a full one-half in our estimate.

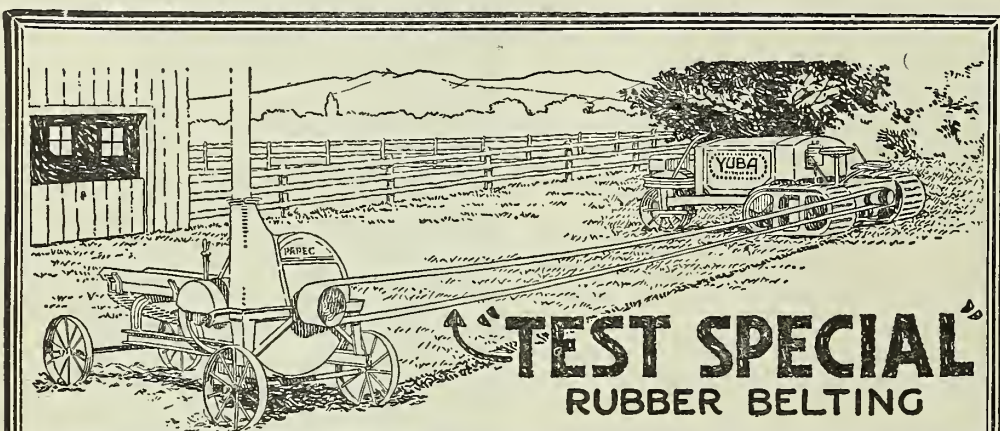
	Pounds
Five months' consumption of insects .....	384,000,000
Seven months' consumption (October to May) of insects .....	192,000,000
Grand total for the year .....	576,000,000

To elucidate further for my own edification (I cannot comprehend large numbers), let us see how many carloads (minimum weight 24,000 pounds) this will be—answer, 24,000 cars. Our railroad agent tells me 50 cars 42 feet long with the locomotive, tender and way car would make an average train. Then it would require 480 trains of 50 cars, measuring from cow catcher to rear of way car, a total of 2,200 feet, and if these 480 trains of 50 cars each were coupled together in one continuous straight line they would extend from the Kansas-Oklahoma state line on the south to the Kansas-Nebraska state line on the north, a distance of 200 miles.

Gentle reader, try to estimate the worth and practical benefit of Kansas birds to our great agricultural state.

What do these feathered protectors of our gardens, farms, plains and forests require for this service? A place in which to nest and rear their young in security. These friends and servants are constantly diminishing in numbers.

Are you devoting your spare time and affection to your house cat and her kittens? Each cat consumes on an average of fifty birds a year. Are you arming your boys with small guns that they may become sportsmen? It requires much practice to become a good shot, and any kind of a bird makes a good target. Are you constructing nest boxes for martins, bluebirds, wrens and woodpeckers? We have fairly good laws, but we need a better one providing for the teaching of ornithology in all the grades of our public schools. Identify yourself with some bird protection society, and let us all assist in saving one of our nation's most valuable assets, our native birds. Let their destruction go on and in a comparatively few years insect life will have multiplied to such an extent that trees will be denuded of their foliage. Plants will cease to thrive and agricultural crops cannot be raised. This is not fancy, but a truthful statement of plain facts, the evidence of which is observed every day in the disappearance of myriads of insect pests with the devastation which follows.



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2)



## Means of Accomplishing Orchard Tillage

By Ralph Sundquist, Yakima, Washington

AS to the value of tillage versus cover crops, we have had considerable discussion. I will suppose that tillage in an orchard is desirable, at least part of the time, that is, we may rotate our orchards so that part is in cover crop and part in tillage, or that we have our orchard in tillage some years, and in cover crop other years, but at the same time clean tillage is desirable.

If our orchards are in clean tillage constantly, the hot sun of our apple valleys will burn out all organic substances in the soil, and if in cover crop constantly, it becomes difficult, in our irrigated regions, to distribute the water properly. With proper means of handling it, livestock, especially hogs, will no doubt rid the orchard of rodents.

Then, in the matter of tillage, it is necessary first to briefly review its purposes. Among ancient agricultural practices, we find that tillage was done entirely in order to eradicate weeds. In the course of time, however, it was discovered that the moisture content of the soil was increased by tillage. The scientific reasons for this were discovered a great deal later than the fact itself, however. But now we recognize these two reasons as the fundamental principles underlying soil tillage, though commonly we till to conserve moisture, and thus the weeds take care of themselves.

Now then, what are the peculiar requirements of proper tillage in an orchard? There are at least three.

1. We must work up the soil early in the spring, before it forms a crust on the surface.

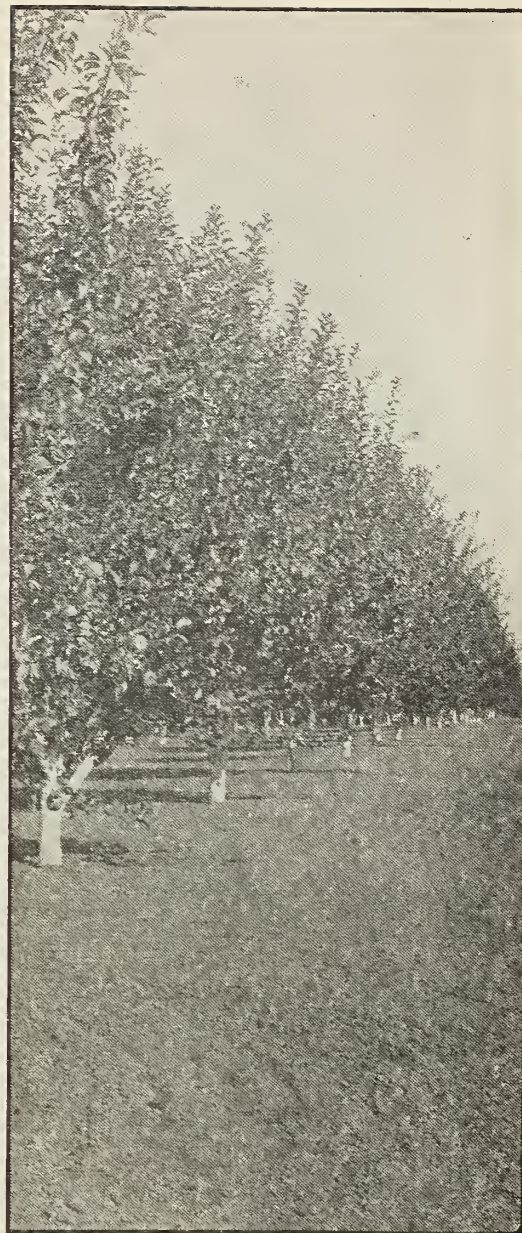
2. The soil must be left in a pulverized condition, and as level as possible.

3. The tillage must be continued throughout the early summer, at least after each irrigation, in our irrigated valleys, which necessitates that in bearing orchards, the means of tillage must be such as to enable the operator to till as late as possible in the summer, without breaking the heavily laden branches or knocking down the fruit.

In this discussion I will speak principally from the point of view of requirements in irrigated districts, as the larger proportion of our fruit in Washington is grown in the irrigated regions.

Now let us consider these requirements, taking up the first two together. The early spring tillage must not be started until the soil has lost any tendency to puddle. A disk harrow is the best tool for pulverizing soil, but with horse cultivation, using the standard size of team disk harrow, the process of disking the soil is so slow that, if one has any appreciable acreage, a great many teams and harrows will be required to cover the ground in the allotted time. But this is not satisfactory. Furthermore, with present cost of horse feed and labor to care of teams, the keeping of additional horses for spring work brings up the cost of operation very rapidly. Spring tillage can be and always has been, done by horses, but is it entirely satisfactory? Naturally, in this age, our attention is drawn to the use of motor power. Our recently developed small size tractors are built to pull, all day long, a tandem disk harrow, which would exhaust four horses in a few hours' time. With the wide cut and the greater spread of the tractor it is possible to cover the ground very quickly. As far as accomplishment is concerned, evidence seems to favor the tractor for early spring tillage in the orchard.

The tillage must be continued throughout the early summer, at least after each irrigation, in our irrigated valleys. It has been a custom among many fruit growers to till the soil in the spring, and until the weight of the fruit bends down the branches, but after this to leave the irrigation ditches permanently, depending on the shading from the trees to check an excessive evaporation. From observations on several orchards, it has been my conclusion that this practice results in small apples. Though the irrigation water is turned into these furrows every two or three weeks, the fruit suf-



Fine example of dust mulch to conserve moisture.

fers from a lack of moisture. The ground becomes packed and baked and will not absorb sufficient water, and the crust which has formed and the packed nature of the soil, favors capillarity to the extent that what little moisture does seep in is quickly lost by evaporation as soon as the water is turned off. Here the low built tractor which is capable of pulling a wide orchard tool, fills a place that no other means of tillage can fill. There are many tractors on the market each claiming superior points over others.

The main consideration in the choice of a tractor best suited for orchard conditions is that the machine must have extraordinary tractive ability. I say extraordinary, because more traction is required from a machine suited for orchard purposes than for any other. In the first place, this tractor must constantly operate in a very loose, deep soil mulch. Wheel tractors are limited in their tractive ability by the size of the wheels, the larger the wheels the better the traction, while the large size of wheels is at the same time disadvantageous in that it raises the tractor up too high and the high moving wheels are themselves a source of considerable breaking of limbs and knocking down of fruit. Furthermore, many of our best orchards are located on sloping land, the sites being especially

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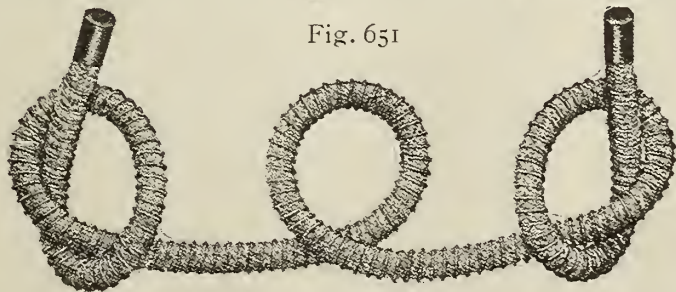
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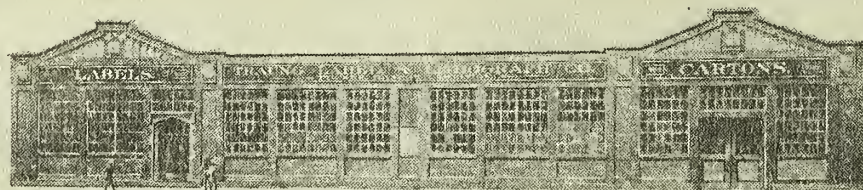
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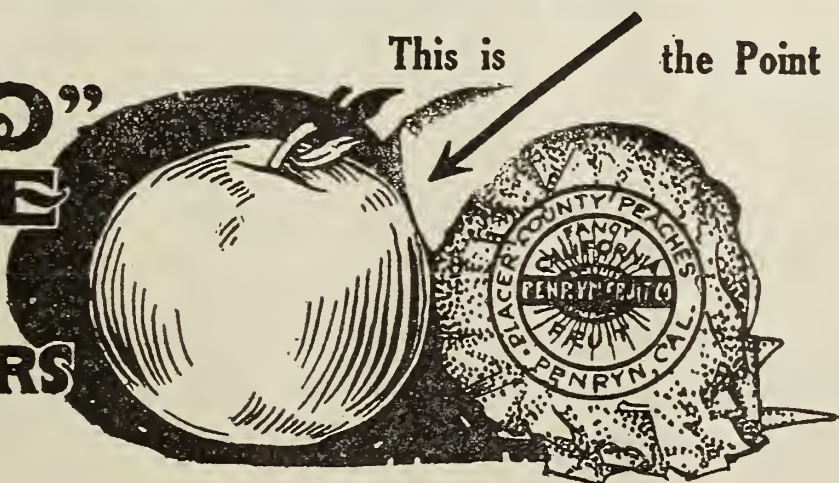
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